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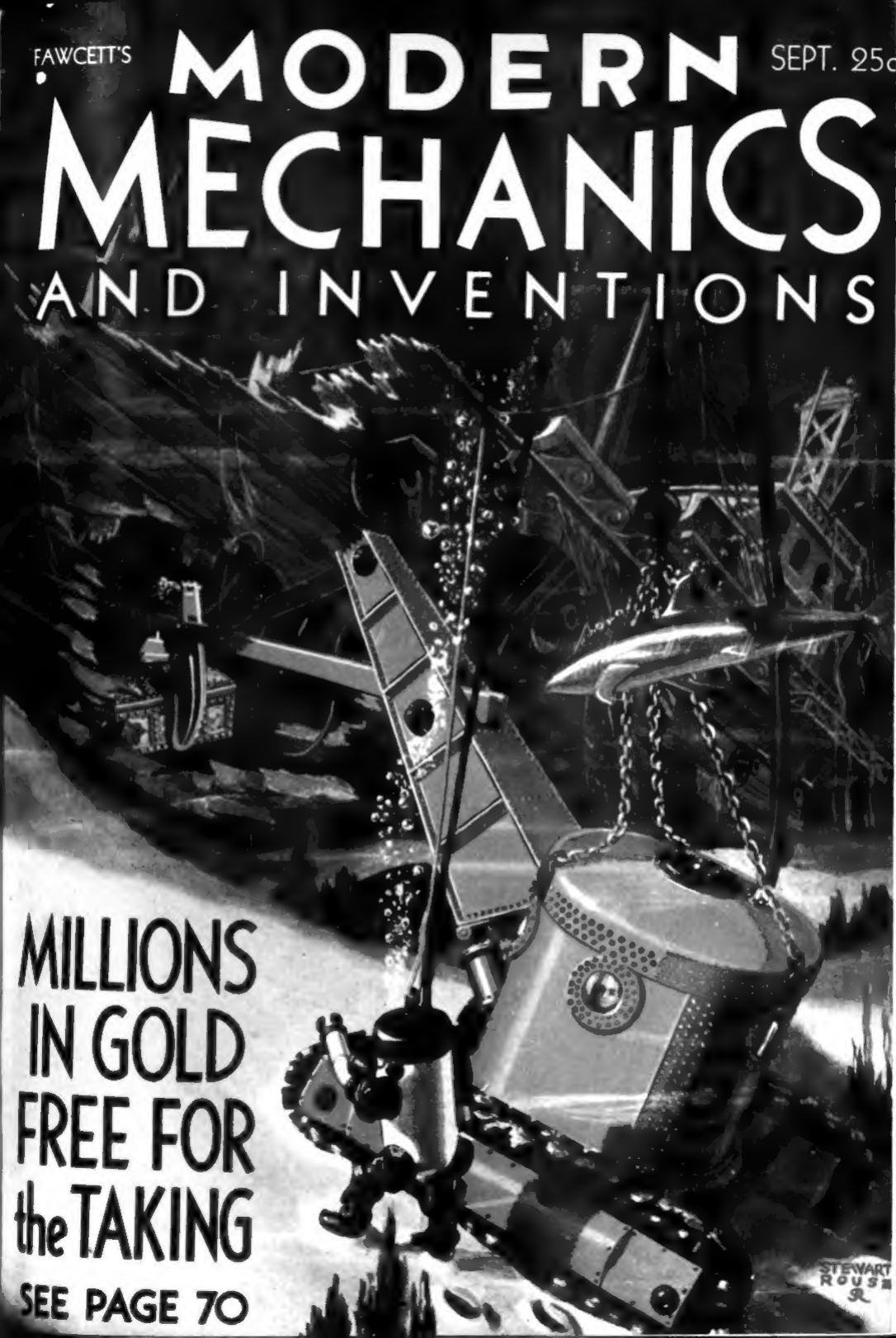

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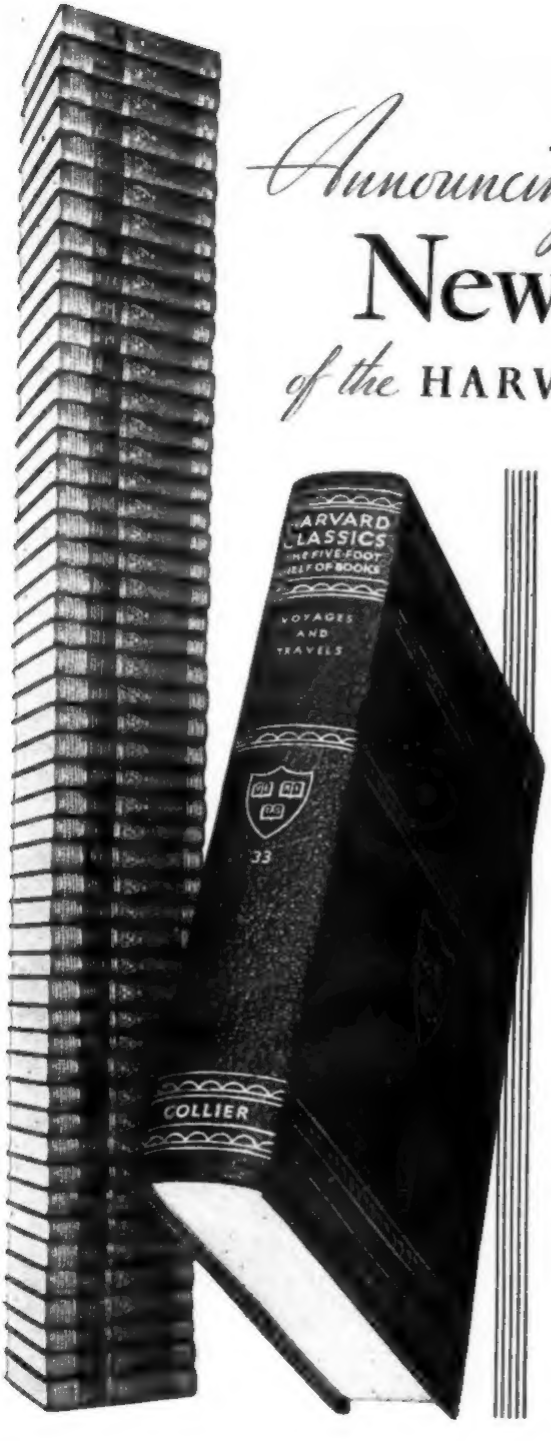

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MODERN MECHANICS AND INVENTIONS

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They Told Him Salesmen Were "Born"

But Now He Makes $10,000 a Year ...Thanks to This Little Book

IT WAS just a little free book that showed Ed Pinkham that he could be different from the rest of the men in our shop. Nobody ever imagined that Ed would land, even in the $5,000-a-year class, let alone be making $10,000 before he was thirty. Ed didn't know himself the abilities he had in him as a money-maker.

But one day, a strange occurrence changed his whole life. During his lunch hour Ed started to read a little book he had brought to work with him.

"It's a book called 'The Key To Master Salesmanship,' Bill," he told me. "It's the most amazing thing I ever read. I never dreamed there was so much in salesmanship. You ought to send for a copy yourself. It's free."

"Huh!" said Luke Jones. "Does that book tell you how to become a salesman?"

"It sure does," replied Ed, enthusiastically.

"Don't waste your time," advised Luke. "You can't learn how to be a salesman. A fellow has to be 'born' that way to be a good salesman."

Ed just smiled at that, but he said nothing. Soon afterward he quit the shop, and we forgot about him. And then last night, I met Ed again—driving a snappy new sedan and dressed like a million dollars.

"For Pete's sake," I said. "What are you doing nowadays, Ed?" He smiled. "City sales manager for the Steel Castings Company," he told me. "What are you doing?"

"Still at the shop," I replied. "But what I want to know is, how do you come to be sales manager for Steel Castings? They're one of the biggest firms in the business."

Ed smiled again. "Remember that book on Salesmanship that Luke Jones was kidding me about one day? Well, when I finished my Salesmanship training the Association I took it from gave me a choice of a number of jobs through their Free Employment Department, and I took a position as salesman for Steel Castings Company. They made me City Sales Manager three months ago at ten thousand dollars a year."

"Good night!" I said. "And Luke and I are still punching the old time clock!"

Ed looked at me seriously. "See here, Bill," he said. "Are you sport enough to risk two cents that you can do as well as I did? Then spend the two cents to write to the National Salesmen's Training Association tonight and get their free book. Then take their course. When you are qualified, their Free Employment Department will help you get a good sales job. Not only will they help you get the job but they agree under an iron-clad money-back penalty that you must be satisfied with the training received—or they refund your tuition!"

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A book—but what a book! Just seven ounces of paper and printer's ink—but it reveals facts and secrets that have led hundreds of men to success beyond their fondest expectations! See for yourself—FREE—why thousands have increased their earning capacities, after reading "The Key To Master Salesmanship." A. L. Galbraith of Detroit, Michigan, went from a bank teller's job to the position of branch manager of a large insurance company, after this book opened his eyes. You can understand how it helped A. A. Fidler of Montgomery, Alabama to raise his pay 700%. You'll know how it made C. B. Sterling of Boldman, Kentucky an officer and manager of his Company, raising his pay to ten times what it was. Learn for yourself the REAL TRUTH about salesmanship. You do not risk one penny nor incur the slightest obligation. And since it may prove the turning point in your career it is certainly worth your while to fill out and mail the coupon below. Do it now!

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Listed here are the members of the Modern Mechanics Board of Editors, all qualified by national repute to serve as authorities. They will gladly answer questions from readers if stamped envelope is sent. Address them in care of this magazine, 529 S. 7th St., Minneapolis, Minn.

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[3] ELECTRICITY is not one but virtually fifty industries all combined into one huge enterprise.

[4] ELECTRICITY has changed practically every mechanical line of work. Electricity has made possible — the aeroplane — the automobile — light — power — transportation — communication — electrical refrigeration—and what not. While electrical controls have electrified all mechanical processes.

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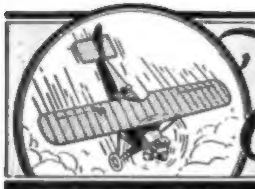

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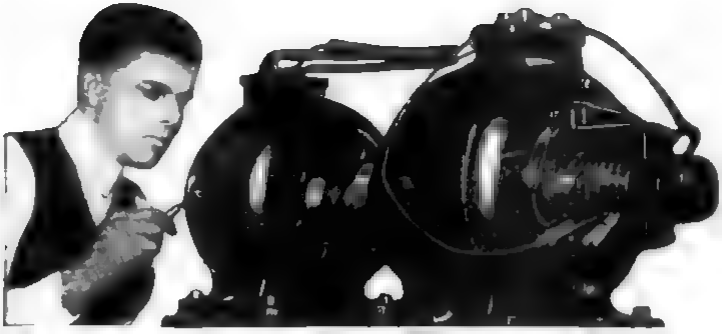
Von Hoffmann Air College training open only to students 17 years or older. If you are under 17, send for information on our Home Study Preparatory Course.

MEMBER

Write for "What Aviation Offers You."

VON HOFFMANN AIR COLLEGE

Lambert-St. Louis Municipal Airport — Saint Louis, Missouri.



Amazingly Easy Way to get into ELECTRICITY

Don't spend your life waiting for $5 raises in a dull, hopeless job. Let me show you how to prepare for a real job and how to make real money—in ELECTRICITY, the live, money-making field. Getting into Electricity is far easier than you imagine!

12 Weeks of Practical Shop Training

Come to Coyne in Chicago and learn Electricity the quick and practical way—by actual shop work on actual machinery and equipment. No useless theory! The average time to complete the course is only 12 weeks. You work on real dynamos, switchboards, armatures, auto and airplane engines, transmitting stations, etc.—everything from door bells to power plants—in full operation every day! No previous experience necessary.

PREPARE FOR JOBS LIKE THESE

Here are a few of the splendid positions open to Trained Electrical Men:

Power Plant Operator $40 to $60 a week
Maintenance Engineer $2,500 to $6000 a month
Armature Winding $45 to $75 a week
Auto Ignition $45 to $65 a week
Contractor - Dealer $3,000 to $10,000 a year
Motor Inspector $2000 to $3000 a month
Electric Lighting $40 to $70 a week
Signal Engineering $50 to $75 a week

FREE Employment Service to Students

When you graduate, we'll do all we can to help you get the job you want. We employ three men on a full time basis whose sole job is to help secure positions for our students. Also we'll help you to earn while learning. Some of our students pay a large part of their living expenses through part-time work we get them.

NOW IN OUR NEW HOME

This is our new fireproof, modern home wherein is installed thousands of dollars' worth of Electrical equipment of all kinds. Every comfort and convenience has been arranged to make you happy and contented during your training.

COYNE Is 32 YEARS OLD

Thirty-two years is a long time. No school or business could continue that long unless it were rendering real service and getting real results. Yet Coyne has been located right here in Chicago since 1899. Coyne Training is tested — proven by hundreds of successful graduates.

What Graduates Say About Coyne

"One week after graduating, I started my electrical job," writes Leland Hinds of Indiana. "After graduating I was home only two days when appointed Engineer in a light plant in South Dakota," writes George Bagley, of Canada. "Two weeks after graduating I received a splendid job. The main consideration given my application was that I was a Coyne Trained man," reports Harold Soucy of Illinois. "I wish to thank your Employment Manager for securing this position for me," writes Albert Yagon, "he sent me out to this Company the first day and I was employed there immediately." And I could go on quoting from hundreds of letters of successful Coyne Trained Men. What they have done, you should be able to do!

Get The Facts

But get all the facts! You can find out everything absolutely free. JUST MAIL THE COUPON BELOW FOR A FREE COPY OF OUR BIG ELECTRICAL BOOK, telling all about jobs . . . salaries . . . opportunities. This does not obligate you. JUST MAIL THE COUPON!

COYNE ELECTRICAL SCHOOL
H. C. LEWIS, President
500 S. Paulina Street, Dept. 61-53, Chicago, Ill.

H. C. LEWIS, President
Coyne Electrical School, Dept. 61-53
500 S. Paulina Street, Chicago, Illinois

Dear Mr. Lewis:
Without obligation send me your big free catalog and all details of Free Employment Service and how I can "earn while learning."

Name.....

Address.....

City..... State.....

YOUR NEXT RAISE—*when and why?*

Will it be a small one and grudgingly given?

Or a big one, made unasked, because the firm wants to keep you satisfied?

You can compel the raise you want—fairly and squarely.

YOU don't start home nights with your eyes closed—stumbling and groping—and expect to get there. Then why are you stumbling blindly along, hoping and waiting for your next raise, praying that it may be more than a few dollars a week and knowing you'll probably be disappointed?

Common sense and your own experience tell you that while modest raises may be given for loyalty and long service, the big ones come only as rewards for increased ability—greater value to your employer.

If you want to get to the place where salaries are substantial and raises come unasked instead of as a form of business charity, you must make yourself an unusual man—you must train yourself out of the masses into the classes.

That you may know exactly what we mean, here are three cases, *three out of over fifty thousand in our files.

Asked to Name His Own Salary

For more than twenty years he had been slaving away at low wages, till finally, 47 years old and still receiving only thirty dollars a week, this New York man resolved to be a bookkeeper no longer. He enrolled for training in Higher Accountancy. Almost immediately after completion of the course, there came the offer of a bigger job.

Less than three years later, the very company he had worked for as a clerk invited him to come back on his own terms. He returned as Auditor, at a salary increase of better than 300 percent. Today he is secretary-treasurer of this company.

Home-Study Training and a College Man

Altho he had a college education, he had not been able to climb higher than a mechanic's job in a little Ohio garage—working long hours for a pittance—until he learned three years ago about our home-study training in Modern Salesmanship.

Two years later, he was manager and his pay check was large in proportion.

The New LaSalle Business Training Courses

Business Management
Higher Accountancy
Expert Bookkeeping
C. P. A. Coaching
Modern Salesmanship
Traffic Management
Law: LL. B. Degree
Commercial Law
Industrial Management
Modern Foremanship
Personnel Management
Banking and Finance
Credit and Collection Correspondence
Business English
Effective Speaking
Telegraphy
Commercial Spanish
Railway Accounting
Railway Station Management
Paper Salesman's Training
Modern Business Correspondence

"Good-Bye, Bench, I'm Superintendent Now —and in only 14 months"

"A year ago the third of March, I was a tool and metal pattern maker. I was that day made a foreman, and soon afterward I took up LaSalle training in Industrial Management. In May of the following year—due largely to the application of the efficiency principles laid down in your training—I was made superintendent. During this time I made a reduction in my department overhead of about 6 percent and an actual labor-cost reduction of 25 percent."

So writes another LaSalle member after only 15 months of spare time study.

Are You Really in Earnest?

You probably are saying right now, "But aren't those exceptional cases?" The best answer to that question is to give actual facts.

In our 100 Percent Club, composed of men and women who have doubled their salaries through LaSalle home-study training, are thousands of members. Many of these report increases of 500, 1,000, even 2,000 percent. Not yet in this club, but climbing fast toward it, are scores of thousands of others who can boast 10, 20, 50, 75 percent increases.

You Can Do the Same—if You Will

Would you care to know more about the special training LaSalle offers in the field you'd like to be in, about the way you can fit it into your evenings and apply it in your daily work? The coupon below, filled out and mailed, will bring you this detailed information, without cost or obligation.

Spend sixty seconds and a two cent stamp. It may change your entire future. At least it is worth investigating.

LASALLE EXTENSION UNIVERSITY,
Dept. 9493-R, Chicago

Please send me full particulars about your new training in the field I have listed, and also a copy of "Ten Years' Promotion in One" all without obligation or cost to me.

.....
(State subject in which you are interested)

Name.....

Present Position.....

Address.....

LA SALLE EXTENSION UNIVERSITY

The World's Largest Business Training Institution

"There's a BIG JOB for the Trained Man in RADIO!"

STUDENTS WORKING ON OUR MODERN TELEVISION TRANSMITTING EQUIPMENT

LEARN RADIO—TELEVISION TALKING PICTURES AT COYNE

Ten Weeks of Shop Training on Radio Equipment

Dissatisfied with your job? Not making enough money? Then let me show you how to prepare for a real job and how to make real money, in RADIO—one of the fastest growing, biggest money-making trades on earth.

Jobs Leading To Big Pay

Scores of jobs are open—jobs as Designer, Inspector and Tester—as Radio Salesman and in Service and Installation work—as Operator or Manager of a Broadcasting Station—as Wireless Operator on Ship or Airplane—with Talking Picture Theatres and Manufacturers of Sound Equipment—with Television Laboratories and Studios—fascinating jobs, offering unlimited opportunities to the Trained Man.

PRACTICAL SHOP TRAINING

Come to Coyne in Chicago and prepare for these jobs the QUICK and PRACTICAL way—BY ACTUAL SHOP WORK ON ACTUAL RADIO EQUIPMENT. Some students finish the entire course in 8 weeks. The average time is only 10 weeks. But you can stay as long as you please, at no extra cost to you. No previous experience necessary.

BROADCASTING TELEVISION SOUND EQUIPMENT

In addition to the most modern Radio equipment, we have installed in our Shops a model Broadcasting Station, with sound proof Studio and modern Transmitter with 1,000 watt tubes—the Jenkins Television Transmitter with dozens of home-type Television receiving sets—and a complete Talking Picture installation for both "sound on film" and "sound on disk." We have spared no expense in our effort to make your training as Complete and Practical as possible.

Free Employment Service to Students

After you have finished the course, we will do all we can to help you find the job you want. We employ three men on a full time basis whose sole job is to help our students in finding positions. And should you be a little short of funds, we'll gladly help you in finding part-time work while at school. Some of our students pay a large part of their living expenses in this way.

COYNE IS 32 YEARS OLD

Coyne has been located right here in Chicago since 1899. Coyne Training is tested—proven by hundreds of successful graduates. You can get all the facts absolutely free. JUST MAIL THE COUPON FOR A FREE COPY OF OUR BIG RADIO AND TELEVISION BOOK.

H. C. Lewis, Pres. **Radio Division** Founded 1899

COYNE ELECTRICAL SCHOOL

500 S. Paulina Street, Dept. 61-1H, Chicago, Illinois

H. C. LEWIS, President

Radio Division, Coyne Electrical School
500 S. Paulina St., Dept. 61-1H, Chicago, Ill.

Send me your Big Free Radio and Television Book. This does not obligate me in any way.

Name .....

Address .....

City ..... State .....

DO YOU LIKE TO DRAW?

TRAINED ARTISTS HIGHLY PAID

THIS is indeed the age of opportunity for the young man or woman who likes to draw. Every age and race understands pictures. Literally millions of dollars are spent annually for magazine and newspaper illustrations, cover designs, pictures in ads, posters, etc. Modern business offers rich rewards to the trained artist who can produce *good* work.

FEDERAL TRAINING GETS RESULTS!

Invest your spare time in your ability to draw. Federal Training, based on 25 years of actual experience in producing illustrations and designs, will give you practical knowledge, and bring you to the earning point in the shortest possible time. You receive illustrated lessons by many leading artists and illustrators, and *individual personal* criticism of your work. Many Federal Students and Graduates are earning $2,000, $4,000, $5,000 and $6,000 yearly—some much more.

YOUR ART ABILITY ANALYZED FREE

If you like to draw, here is your opportunity to find out if it will pay to develop your talent. This fascinating free test has been an eye-opener to many. It tests your sense of design, proportion, color, perspective, etc., you will be frankly told what your score is.

Free Book, "Your Future," tells all about the Federal Course in Commercial Designing and how commercial artists all over the world are succeeding with its help. It's an inspiration to anyone interested in drawing. Fill out and mail the coupon today and get this book and art ability questionnaire.

Federal Schools Inc.

924A Federal Schools Bldg.
MINNEAPOLIS, MINNESOTA

COUPON

Federal Schools of Commercial Designing,
924A Federal Schools Building,
Minneapolis, Minnesota.

Please send me Art questionnaire and book "Your Future."

Name .....
Age..... Occupation.....
Address .....

Results Count!

Byron C. Robertson says:

"The reason why I enrolled with the Federal Schools was that they had many students to point to who had made good. Today I am on the art staff of one of the largest illustrating concerns in America, receiving a salary of $3,900.00 a year."

From Mr. W. A. Sowell:

"I am Art Director with a salary and commission which has made it possible for me to earn more than at any time in my life, for example, last month over $400.00 and the last four months it has averaged $300.00. I know this all came about from the excellent instructions I received from the Federal Schools."

Mr. Edwin McTeer says:

"I suppose you remember I opened my own independent commercial art studio, and to make a long story short, my earnings are now at the rate of over $10,000.00 a year."

Men Who Know

"We recommend your course highly to anyone contemplating art work as a livelihood, and shall certainly call upon you when in need of more artists."

SUFFOLK ENGRAVING & ELECTROTYPING CO.
Boston, Mass.

"You certainly have a galaxy of the best known and most capable artists in the country contributing to this course. I can well understand how and why the Federal Art Course has become so successful."

JAHN & OLLIER ENGRAVING CO.
Chicago, Illinois

THE SCHOOL FAMOUS FOR SUCCESSFUL STUDENTS

Major Rockwell
World War Flyer
Who Will Teach You

Major Rockwell is a famous world war flyer, decorated with the Legion of Honor and the War Cross. He is now devoting full time to teaching Aviation, and he will train you for a position in this great new industry as only a Veteran World War Flyer can train you. Under Major Rockwell's guidance your future in Aviation is assured.

Major Rockwell, U.S.R. Air Corps, Says:

"I'll Train You at Home

—and Show You How to Quickly Master Every Principle of Ground Training Which Is Necessary Before You Are Ready to Take Your Place in Any Branch of Aviation"

Of course you want to get into Aviation quickly! Every man, young and old is eager to take his place and insure his future in the world's fastest growing industry. Now is the time for you to start! And my Home Training Course is the easiest, quickest, least expensive way for you to make the start. Mail coupon for my fascinating book which gives all details.

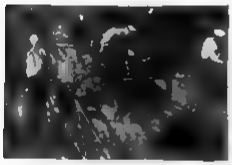
You Learn Aviation Ground Work at Home---Then Choose Any of the 40 Ground Jobs

Right in your own home, devoting about an hour a day, I teach you the essential Aviation fundamentals covering every phase of ground work, as well as the principles of flying and navigation. This is the same instruction that you would receive if you went away to a ground school. It makes no difference whether you intend to fly or to make your mark in Aviation as a designer, rigger, motor expert, repairer, inspector, builder or in any of the 40 ground jobs, you must have this highly important ground work instruction to land any real good job in this new fast-growing industry. I will help you find your proper place in Aviation and start you on the right road to sure success. Manufacturers, Transport Companies and Airports prefer Rockwell trained men. Then if you want to go farther and take up actual flying, you can come here to Dayton where I'll see that you get your flying instructions — at special reduced prices.

40 Ground Jobs for Every Airplane

Every airplane in service means 40 men on the ground.

Riggers
Designers
Electricians
Metal Workers
Draughtsmen
Plane Mechanics
Motor Inspectors
Air Port Managers
Welders
Transport Managers
Etc., etc.



Your Job Is Here

No Advance Education or Experience Needed

You don't need to have any previous education to start my course. You do not even need to know anything about airplanes or mechanics. My home training course is thorough and complete. Everything is clearly explained with easy-to-understand text and pictures. In a few short months you will have grasped every fundamental principle of aviation ground work and you will be well on the road to qualify for any important aviation job. My Home Training Course will also give you all the knowledge necessary to pass the Government's written examinations for mechanics or pilots licenses.

Aviation Trained Men

Only TRAINED men can command the high salaries Employers are glad to pay big money for men who know Aviation. Builders, mechanics, service and maintenance men, and flyers. Let me prepare you for an Aviation job. I will prepare you at home to take your place in the most fascinating, fastest growing industry in the world. Rush this coupon to me for a copy of my famous free book.

Money Back Agreement

I am so certain of your success in Aviation that if you are not satisfied after completing my course, I will refund every cent of your tuition.

Employment Service

After you graduate I give you Free Employment Service and help you get a job without cost.

Major ROBERT L. ROCKWELL,
The DAYTON SCHOOL of AVIATION
Desk 29
DAYTON, OHIO

Major Rob't L. Rockwell
The Dayton School of Aviation
Desk 29, Dayton, Ohio.

Dear Major: Please send me FREE and without obligation a copy of your famous book on Aviation, also your special tuition and position offer.

Name .....
Address .....
Town ..... State ..... Age .....

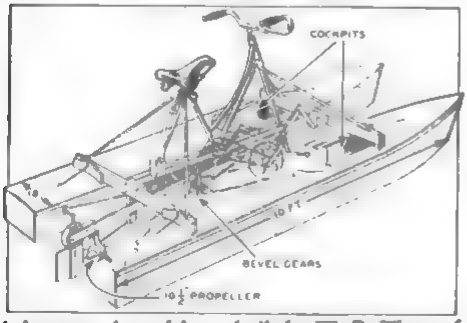
C. E. "Duke" Norman, of Minneapolis, Minn., and his latest achievement in the model building line —a Ford Tri-motor. This job is made entirely of metal, and is one of the niftiest examples of the model-makers' art which I have seen to date. It has a two-foot wing spread, and represents 150 hours of the builder's time. "Duke" wants to hear from model fans. He lives at 2247 McKinley St. N. E.

Andy's Shop Mail Box

Andy, the Double M Lubricant Simian and big brother to all the little grease monks, each month entices the Hangar gang out onto the tarmac and gives them the low-down on the high-flying members.

GREETINGS, Gang! Here I am, back from my fishing trip, and you should see what the bunch have been doing while I was away. I was hoping that you would give me a break and lay off for a while, but I found my mail stacked up so high, that right now I have me doubts as to whether I ever will catch up. We might be having hard times, but the boys always manage to dig up a two-cent stamp, even if they can't find a mate for return postage. There's a mighty fine bunch of letters in this month's mail, so I might just as well begin now to give you a look-see.

See that little drawing down there in the corner? That's a complete "How-to-Build" if you have any imagination at all. The designer of the vehicle sent in a couple of snaps, but I had the artist draw it that way so that the details would become more evident. But let's see what the builder has to say.



A home-made cycleboat, built by W. P. Watts of Oroville, California. Not so fast but darn clever.

Route B, Oroville, Calif.

Dear Andy:

Enclosed you may find some snaps of a "Cycleboat" built by myself and the boys in our shop. The pontoons are of plywood covered with canvas. A cockpit is provided in each pontoon for passengers.

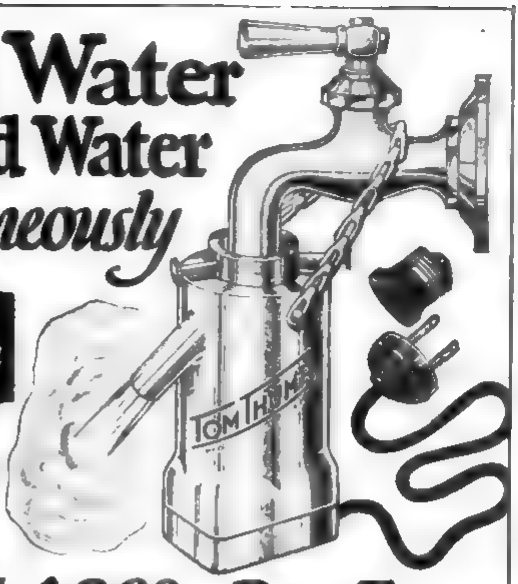
The driving mechanism gives the propeller ten revolutions to one of the sprocket at the pedals. Steering is accomplished by having an arm on an extension of the handle-bar post, with a rudder at the stern.

The framework of the driving unit is of naturally lacquered quartered oak and the metal parts have aluminum paint made with clear lacquer and aluminum powder.

Sincerely yours,
W. P. WATTS.

(Continued on page 20)

Running Hot Water From Your Cold Water Faucet *Instantaneously*



Only $3.75 Complete

Agents! *This Marvelous Invention Will Make Up to $40.00 a Day Easy*

Just plug in at the nearest electric outlet and presto!—you have instantaneous, continuous running hot water from your cold water faucet. This tells you in a nutshell why the invention of the Tom Thumb automatic electric hot water heater will make it easy for you to make up to $40.00 a day.

The electric heated steaming hot water comes direct from the faucet instantaneously—yes, as quickly as you can turn on the current and the hot water runs indefinitely until you shut off the electricity. The cost is small—convenience is great. Useful wherever hot water is needed—no fuss or bother—attached to any faucet in a jiffy. Works on either AC or DC current. You and your customers will marvel and be delighted at this new discovery of electrical science. The small cost of $3.75 for the Tom Thumb, Junior (110 volts) or $5.75 for Tom Thumb, Senior (220 volts) does the work of any expensive hot water heating equipment costing several hundred dollars—the Tom Thumb absolutely eliminates the plumber or any other additional expense.

No Installation - Stick One On Faucet and Sale Is Made

Think of it! no installation, no extra expense—nothing else to do but to stick it on the faucet, turn on electricity and it is there ready for duty. Easily removed when not wanted and easily carried to any part of house where cold water is running and hot water is wanted. Has many uses—too numerable to mention here. Weighs only 1 lb., made entirely of aluminum. Cannot rust, no moving parts, nothing to get out of order.

If $40 A Day Sounds Good To You Rush Coupon

This new scientific invention offers tremendous sales possibilities. At the low price of $3.75 you should be able to sell at least forty a day. You pocket $1.00 cash commission on every sale. If you would like to know all about this proposition, sign your name and address to coupon or, better still, get started selling at once. Attach money order for $2.75 to coupon and rush to us. We will send complete selling outfit containing 1 Tom Thumb electric hot water heater, order blanks, selling particulars and everything necessary to help you get started making up to $40.00 a day at once.

Terminal Products Co., Inc.,
Dept. 1109, 200 Hudson St.,
New York, N. Y.

The Tom Thumb electric hot water heater looks like a big money maker to me. I am sure interested in knowing how to make up to $40.00 a day with this proposition. I have checked below the proposition I am interested in at this moment.

☐ Enclosed find money order for $2.75. Please send me one Tom Thumb Junior, order blanks and selling information. It is understood upon receipt of this sample outfit I will be permitted to take orders and collect $1.00 cash deposit for every Tom Thumb, Jr. I sell, or $1.50 for every Tom Thumb, Sr. I sell. It is understood I will send the orders to you and you will ship direct to my customers C.O.D. for the balance.

☐ I would like to have additional information before acting as one of your agents. Please send this by return mail free of obligation.

Name .....

Address .....

City ..... State .....

If you live outside of the United States, price is $3.00 extra on each unit, cash with order.

PATE

Protect Your Ideas

Take the First Step Today

If you have a useful, practical, novel idea for any new article or for an improvement on an old one, you should communicate with a competent Registered Patent Attorney AT ONCE. Every year thousands of applications for patents are filed in the U. S. Patent Office. Frequently two or more applications are made for the same or substantially the same idea (even though the inventors may live in different sections of the country and be entirely unknown to one another). In such a case, the burden of proof rests upon the last application filed. Delays of even a few days in filing the application sometimes mean the loss of a patent. So lose no time. Get in touch with me at once by mailing the coupon on the opposite page.

Prompt, Careful, Efficient Service

This large, experienced organization devotes its entire time and attention to patent and trade mark cases. Our offices are directly across the street from the U. S. Patent Office. We understand the technicalities of patent law. We know the rules and requirements of the Patent Office We can proceed in the quickest, safest and best ways in preparing an application for a patent covering your idea. Our success has been built on the strength of careful, efficient, satisfactory service to inventors and trademark owners located in every state in the Union.

NO CHARGE for Information

On How to Proceed

The booklet shown here contains valuable information relating to patent procedure that every inventor should have. And with it I will also send you my "Record of Invention" form on which you can sketch your idea and establish its date before a witness. Such evidence may later prove valuable to you. Simply mail the coupon and I will send you the booklet, and the "Record of Invention" form, together with detailed information on how to proceed and the costs involved Do this NOW. No need to lose a minute's time The coupon will bring you complete information entirely without charge or obligation.

My Offices Just Across Street From U. S. Pat. Office

Above is a view of my drafting and specification offices where a large staff of experienced experts are in my constant employ. All drawings and specifications are prepared in my offices.

NTS

Inventors Write for these Free Books

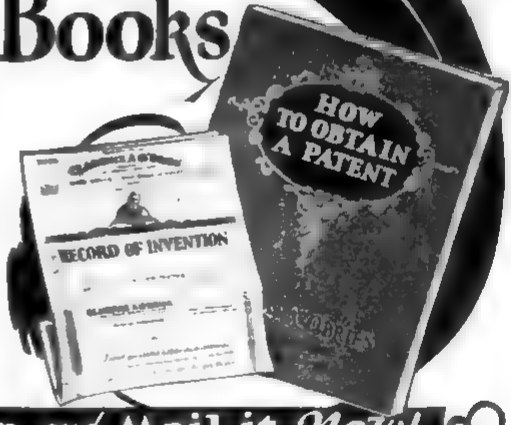
Strict Secrecy Preserved

All communications, sketches, drawings, etc., are held in strictest confidence in strong, steel, fireproof files, which are accessible only to authorized members of my staff. Feel free to write me fully and frankly. It is probable that I can help you. Highest references. But FIRST—clip the coupon and get my free book. Do THAT right now

Clarence A. O'Brien

Registered Patent Attorney

Member of the Bar of The Supreme Court of the United States, U. S. Court of Customs and Patent Appeals, U S Court of Claims, Court of Appeals, District of Columbia and Supreme Court of the District of Columbia.
Practice confined exclusively to Patents, Trademarks and Copyrights



Clip this Coupon *and* Mail it *Now!*

CLARENCE A. O'BRIEN, *Registered Patent Attorney*

317-B, Security Savings and Commercial Bank Building
WASHINGTON, D. C.
(or, Suite 1106 Woolworth Bldg., Dept. C-15, New York City)

Please send me your free book, "How to Obtain a Patent," and your "Record of Invention" form without any cost or obligation on my part.

Name

Address

(Important—Write or print plainly, and address office nearest you)

"You won't be laid off!"

"It's tough when fellows get laid off. They've been cutting down some at our plant and everybody has been worried, wondering where the axe would fall next. "It made me feel mighty good yesterday when the boss stopped and said he had a better job in mind for me. 'It's trained men like you we need around here,' he said, 'and it's too bad we must let some of the untrained go. If those fellows had used the foresight you did, and studied with the International Correspondence Schools, we'd be mighty glad to keep them too. Trained men never need to worry about their jobs around here!'"

● ● ●

Today, in all parts of the world, through training supplied by the International Correspondence Schools, thousands of men have made themselves so valuable that promotions and raises come to them regularly. In this modern age, it is the trained man who goes ahead! You can become a trained man! Why not find out how?

Just mark and mail the coupon today

INTERNATIONAL CORRESPONDENCE SCHOOLS
"The Universal University"
Box 2316-M, Scranton, Penna.

Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the subject *before* which I have marked X:

TECHNICAL AND INDUSTRIAL COURSES

☐ Architect	☐ Automobile Mechanic
☐ Architectural Draftsman	☐ Plumbing ☐ Steam Fitting
☐ Building Estimating	☐ Heating ☐ Ventilation
☐ Wood Millworking	☐ Sheet Metal Worker
☐ Contractor and Builder	☐ Steam Engineer
☐ Structural Draftsman	☐ Steam Electric Engineer
☐ Structural Engineer	☐ Civil Engineer
☐ Electric Wiring	☐ Surveying and Mapping
☐ Electrical Engineer	☐ Refrigeration
☐ Electric Lighting	☐ R. R. Locomotives
☐ Welding, Electric and Gas	☐ R. R. Section Foreman
☐ Reading Shop Blueprints	☐ R. R. Bridge and Building Foreman
☐ Telegraph Engineer	☐ Air Brakes ☐ Train Operation
☐ Telephone Work	☐ Highway Engineering
☐ Mechanical Engineer	☐ Chemistry ☐ Pharmacy
☐ Mechanical Draftsman	☐ Coal Mining Engineer
☐ Machinist ☐ Toolmaker	☐ Navigation ☐ Boilermaker
☐ Patternmaker	☐ Textile Overseer or Supt.
☐ Pipefitter ☐ Tinsmith	☐ Cotton Manufacturing
☐ Bridge Engineer	☐ Woolen Manufacturing
☐ Bridge and Building Foreman	☐ Agriculture ☐ Fruit Growing
☐ Gas Engines ☐ Diesel Engines	☐ Poultry Farming ☐ Radio
☐ Aviation Engines	☐ Marine Engineer

BUSINESS TRAINING COURSES

☐ Business Management	☐ Business Correspondence
☐ Office Management	☐ Lettering Show Cards ☐ Signs
☐ Industrial Management	☐ Stenography and Typing
☐ Personnel Management	☐ Complete Commercial
☐ Traffic Management	☐ Civil Service ☐ Mail Carrier
☐ Accountancy ☐ Cost Accountant	☐ Railway Mail Clerk
☐ C. P. Accountant	☐ Grade School Subjects
☐ Bookkeeping	☐ High School Subjects
☐ Secretarial Work	☐ College Preparatory
☐ Spanish ☐ French	☐ Illustrating ☐ Cartooning
☐ Salesmanship ☐ Advertising	☐ Lumber Dealer

Name ..... Age .....

Address .....

City ..... State .....

Occupation .....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

ANDY'S SHOP MAIL BOX

(Continued from page 16)

Pleeuz, pleeuz, gang, remember where you are! This is my personal colyum, and in it I print news of the gang. I haven't any blueprints of this here cycleboat, neither do I know what size nails Mr. Watts used. All the dope I have will be found above. Just the same, I think that drawing gives you enough dope to go ahead and build it if you want to.

Liberty or License

IF you'll remember, a couple of months ago I gave you my opinion of some of these laws the various State Legislatures have been passing, which prohibit the flying of home-built planes. A short time before that I gave you a letter from Alvia Peters, in which he told us of the California Legislature fixing things up to give the amateur aeronut a break. About half of my recent mail has been comment on these points. Here are a few samples:

Albany, Calif.

Andy and the Gang:

About three weeks after I mailed you the California law they made a reprint of it, striking out the "OR IDENTIFIED" and are making it tighter than ever.

BUT, I've got one up my sleeve that will tickle the whole gang. How would you like to build a Lawrence powered two-place side-by-side from approved plans and get that much sought after "C" license. Yes, it can be done and I would be glad to tell you how. Just send me a stamped and addressed envelope. I've nothing to sell.

As ever,
ALVIA PETERS.

I don't know what we'd do without you, Alvia. Sometimes I don't believe in Santa Claus, and then I hear from you again, and right away I hang up my sock and go to sleep with a smile on my face. I'd like to hear more of this myself, Mr. Peters, if you don't mind.

Here's a letter from a guy who seems to know more about this than I do, so I'll let him have his say:

Route 1, Box 23,
Rogue River, Oregon.

Andy Old Grease Ball:

Here I am writing for the first time about Alvia Peters of Albany, Calif., and I second the motion we give him a medal, for now he has done it.

He has worked out a system where a man can get blueprints for a two-passenger ship that he can build himself for about $500.00 and can get a Federal license on it.

I claim that's something, as it will only cost one dollar to join the National Aircraft Build-

(Continued on page 24)

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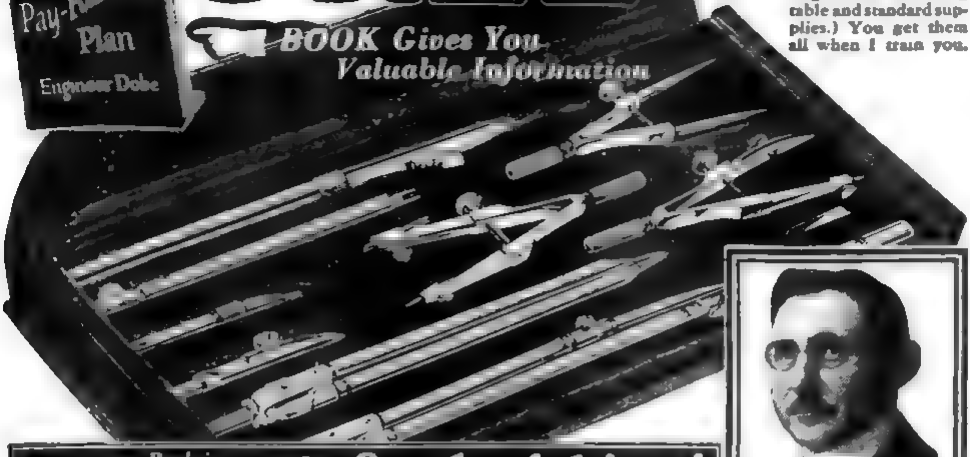

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Drafting is the field for the men who want to get somewhere. For the men who want to be heard from. They get pay that makes working worth while and life worth living.

I'll teach you draftsmanship by the practical methods that make a man easily and quickly finish the whole course. I use modern methods; I employ every short cut; but I leave nothing out that you have to know as my students who make from $5,000 to $9,000 a year prove.

Learn at home, but on the same kind of actual drafting room jobs you are assigned when you go to work. It isn't hard to do. You don't need talent. If you are interested and can read and write, I make you a good draftsman, if you will work. Dobe-trained men are draftsmen and chiefs in big concerns all over the country and many have made good abroad.

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Don't keep yourself down by thinking of your finances at this time. It isn't money I want now. It's men. You, if you mean business. Get started and you will get action. I will have you ready to draft for important pay in any engineering or industrial line you like—before you know it. So, get my proposition in front of you this week. Then if you do enroll, you will get the tools, the drafting table and all of the other supplies right away.

COME ON! Let's get ready now for the better-paying jobs that will be here again. I have students from 16 years of age to 60. So, first of all, and right now, send this coupon for the new, free book, "My Pay Raising Plan."

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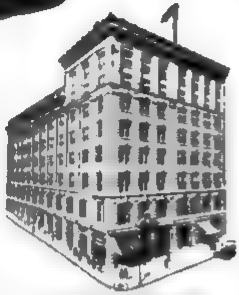

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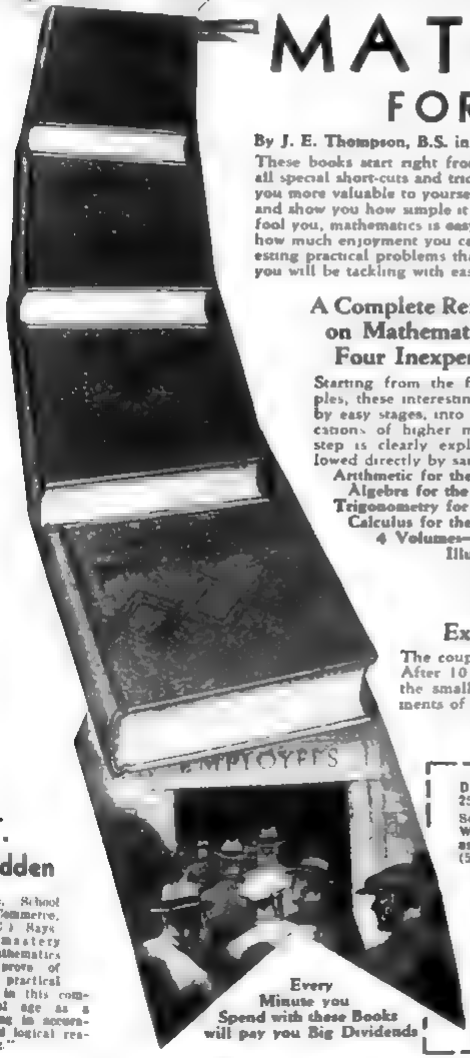

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ANDY'S SHOP MAIL BOX

(Continued from page 20)

ers Association and one dollar a month dues. When he claims to have the whole world beat I'm inclined to believe him as he knows his stuff. Why don't the whole gang write a letter to B. H. Pietenpol and Peters with a lot of thanks for their work, as such fellows need a little encouragement to hold them up.

Respectfully,
D. C. HOUGHAM.

Well there's the layout. Now you know as much about it as I do. Remember, this Aircraft Builders' Association is in no way connected with the magazine. I'm just passing the news on to you. Judging from the following letter, some such an association is desired by some of our readers.

Box 8, Delpaso Heights P. O.,
Sacramento, Calif.

Dear Andy:

I note what you have to say about regulations which have been passed in various states, regulating non-commercial flying and building of aircraft.

I considered this one of the dirtiest deals that the people have been handed since the Volstead Act. As you say, it is only a favor to the aircraft industry. However, just complaining without making any effort to abolish such regulations will not help us out any. Let's start some action.

What methods of procedure would you suggest?

Do you think it would be a good idea to form a fund for the purpose of hiring legal talent to protect us in this matter and fight it out with them? That is the only thing that can be done that I can see.

I believe that there are plenty of sport plane enthusiasts who would be glad to contribute to a fund for this purpose, even though the state in which they live did not have such regulations.

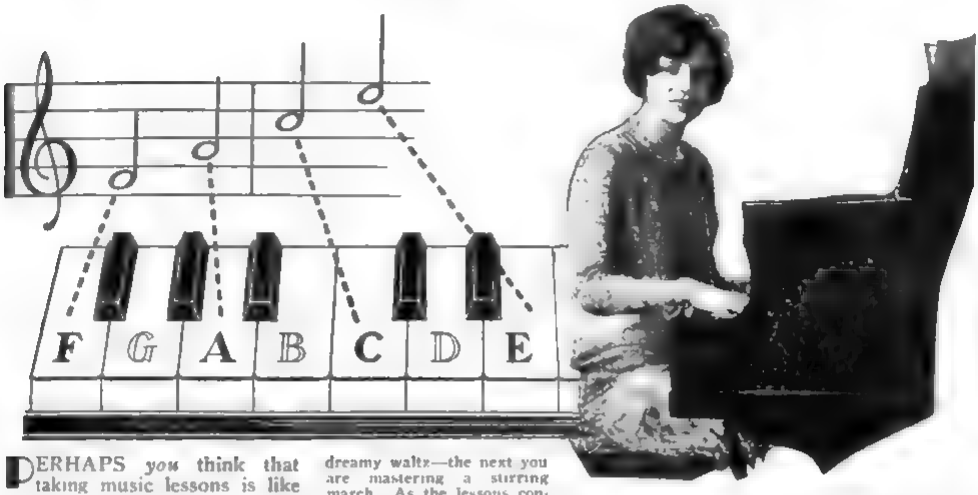
You are in a position to deliver a terrible wallop against such laws with the proper backing, and I am sure you will receive the backing. All you have to do is throw your hat in the ring.

Sincerely yours,
L. RECTOR.

Well, Mr. Rector, I agree with everything you say except that remark about me throwing my hat in the ring. I can see no purpose in dissipating our forces by duplicating our efforts. Alvia Peters seems to have taken the initiative in this fight, and although I have never met him, he seems to size up as the kind of a chap to continue the work. Suppose you fellows write to him and find out what he's doing before you try to draft me. I'm giving the cause a lot of space in a Na-

(Continued on page 26)

To those who think Learning Music is hard-



PERHAPS *you* think that taking music lessons is like taking a dose of medicine. It isn't any longer!

As far as you're concerned, the old days of long practice hours with their horrid scales, hard-work exercises, and expensive personal teacher fees are over and done with.

You have no excuses—no alibis whatsoever for not making your start toward musical good times *now!*

For, through a method that removes the boredom and extravagance from music lessons, you can now learn to play your favorite instrument entirely at home—without a private teacher—in half the usual time—at a fraction of the usual cost.

Just imagine . . . a method that has made the reading and playing of music so downright simple that you don't have to know one note from another to begin.

Do you wonder that this remarkable way of learning music has already been vouched for by over 600,000 people in all parts of the world.

Easy as Can Be

The lessons come to you by mail from the famous U. S. School of Music. They consist of complete printed instructions, diagrams, and all the music you need. You study with a smile. One week you are learning a dreamy waltz—the next you are mastering a stirring march. As the lessons continue they prove easier and easier. For instead of just scales you are always learning to play by *actual notes* the classic favorites and the latest syncopation that formerly you only *listened* to.

And you're never in hot water. First you are *told* how a thing is done. Then a picture *shows* you how, then you do it yourself and hear it. No private teacher could make it clearer or easier.

Soon when your friends say "please play something," you can surprise and entertain them with pleasing melodies on your favorite instrument. You'll find yourself in the spotlight—popular everywhere. Life at last will have its silver lining and lonely hours will vanish as you play the "blues" away.

New Friends—Better Times

If you're tired of doing the heavy looking on at parties—if always listening to others play has almost spoiled the pleasure of music for you—if you've been envious because they could entertain their friends and family—if learning music has always been one of those never-to-come-true dreams, let the time-proven and tested home study method of the U. S. School of Music come to your rescue.

Don't be afraid to begin your lessons at once. Over 600,000 people learned to play this modern way and found it easy as A-B-C. Forget that old-fashioned idea that you need special "talent." Just read the list of instruments in the panel, decide which one you want to play and the U. S. School will do the rest. And bear in mind no matter which instrument you choose, the cost in each case will average the same—just a few cents a day. No matter whether you are a mere beginner or already a good performer, you will be interested in learning about this new and wonderful method.

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Piano	Violin
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*Name*_____

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ANDY'S SHOP MAIL BOX

(Continued from page 24)

tional magazine, and that should help a lot. Double M is behind you boys heart and soul in this cause, although we don't want to go on record, as yet, in endorsing any particular association. My job is to give you the news as it breaks, and to give you fellows who have opinions a chance to express them.

Here's another letter on the same subject by the designer of the "Longster":

Long Radio Works,
Cornelius, Oregon.

To the Editor,
Dear Sir:

Nothing ever went quite so straight to the spot as did Andy's statement about the license situation in July M-M. There never has been a more unjust and dogmatic set of laws gotten up than the several states have passed. Every man is supposed to have a right to enjoy himself in his own way, if he doesn't interfere with the rights of others. If you or I wish to build us a plane and fly it ourselves, on a private field, isn't that our business?

These laws are more than unjust. They positively hurt aviation. If anyone will go to a school and inquire, he will find that the majority of the students are these very boys who scheme and plan to build a ship that is their idea of what a ship should be. Most of them are at heart designers. The building means more than the actual flying. They are the serious thinking boys who will be the leaders of a great industry in a very short time. Why stifle and discourage a born creative instinct? Suppose one does get hurt now and then. They get hurt in racing boats, on skis, in cars, and on the football field. And if one does get hurt, the papers have only to point out that it was an unlicensed ship instead of one bearing the valued "C" (which, between you and I, are the only ones getting smacked).

All commercial ships should be licensed. All pilots should have some sort of a license, or at least pass the medical examination. It would even probably be well if ships carrying more than one pilot were required to have a license. The law should permit and encourage home ship building and solo flying. If it did, there would be a great increase in the number of enthusiasts in this law-ridden country. The thing to do is to start a department of propaganda in M-M for the purpose of having such a law passed in every state. We must have an organization, and it remains for you to start it.

Sincerely,
LES LONG.

I agree with you in everything you say, Les, except that we should become a medium of propaganda. Too many publications, now, are mediums of propaganda. I've given you

(Continued on page 28)

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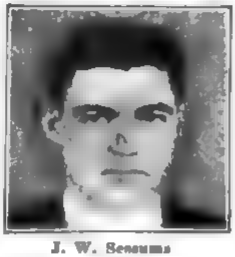

J. W. Sessums

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City..... *State*..

ANDY'S SHOP MAIL BOX

(Continued from page 26)

fellows the basis for getting together. Now it's up to you.

I'm going to close this discussion for this month with a list of the states in which it is possible for the amateur to build and operate his own crate for non-commercial purposes:

Alabama, Colorado, District of Columbia, Georgia, Hawaii, Illinois, Kentucky, Louisiana, Missouri, Nebraska, Nevada, New Jersey, New York, North Carolina, Ohio, Oklahoma, South Carolina, Philippine Islands, Tennessee, Utah and West Virginia.

A state license, the requirements of which are not known to me at the present time, are required in the following states:

Arkansas, Connecticut, Florida, Kansas, Maine, Maryland, Massachusetts, New Hampshire, Oregon, Pennsylvania, and Virginia. Those living in these states should write to their Secretary of State for a copy of the regulations.

A Federal license is required in all other states.

BUT with all this attention to our aeronuts, we've been neglecting the fellows who haven't yet decided to sprout wings. Here's an auto-racing bug who seems to have something to say. Let's tune in on him:

6847 Dorchester Ave.,
Chicago, Ill.

Dear Sir:

I would like to put in my nickel's worth of say about this racing car business.

There are three general methods of building up a fast car suitable for dirt track racing. The first is the rebuilt stock car—Ford, Chev or Dodge.

Here is an example. One of our bunch, now a leading driver on the dirt tracks, bought an old Ford for $100, and by spending $20.00 more for overhead valves and wire wheels, completed a very fast car, and a money maker at the county fairs of Illinois.

Here's how he did it. Remember, all the rest of the car was stock Ford parts except for a Chevrolet oil and Dodge water pump.

Take a stock model T frame and shorten it four inches at the rear. Bolt a 2" angle-iron straight across the front, and place the front spring under the middle of the projecting ledge. Saw the front wishbone at the apex, and bolt each end up against the side of the frame with a ½" bolt through the frame and tie-rod and acting as a pivot. This lowers

(Continued on page 36)

Railway Postal Clerks

$158 Month First Year
Raise to Maximum of $225 Month

Many Other U. S. Government Jobs Open to Men and Boys 18 to 50

POST OFFICE CLERKS RURAL MAIL CARRIERS CITY MAIL CARRIERS
IMMIGRANT INSPECTORS CUSTOMS INSPECTORS

These are steady positions. Strikes, poor business conditions, lockouts or politics do not affect them. U. S. Government employees get their pay for full twelve months every year. There is no such thing as **"HARD TIMES"** in the U. S. Government Service.

ALLOWANCE FOR HOTEL EXPENSES

Railway Postal Clerks now get $1900 the first year regularly, being paid on the first and fifteenth of each month, $79.16 each pay day. Their pay is increased $100 and $150 a year. The maximum is $2700 a year, $112.50 each pay day. They get extra allowance for hotel expenses when away from home.

PAID VACATIONS

Railway Postal Clerks, like all Government employees, are given a yearly vacation of 15 working days (about 18 days). When on runs they usually work 3 days and have 3 days off duty or in the same proportion. During this off duty and vacation, their pay continues just as though they were working. When they grow old, they are retired with a pension. As Railway Postal Clerks are continually traveling, they have an excellent chance to see the country.

CITY MAIL CARRIERS—POST OFFICE CLERKS

Clerks and Carriers get $1700 the first year, regularly and automatically increase $100 a year to $2100 with further special increase to $2300. They also have 15 days' vacation. City residence is unnecessary.

What Will You Earn 5 Years From Now?

Compare these conditions with your present or your prospective condition, perhaps changing positions frequently, kicking around from post to pillar, no chance in sight for PERMANENT employment, frequently out of a position and the year's average salary very low.

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ROCHESTER, N. Y.

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—Post Office Clerk	($1700-$2300)
—City Mail Carrier	($1700-$2100)
—Rural Mail Carrier	($2100-$3400)
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Address .....

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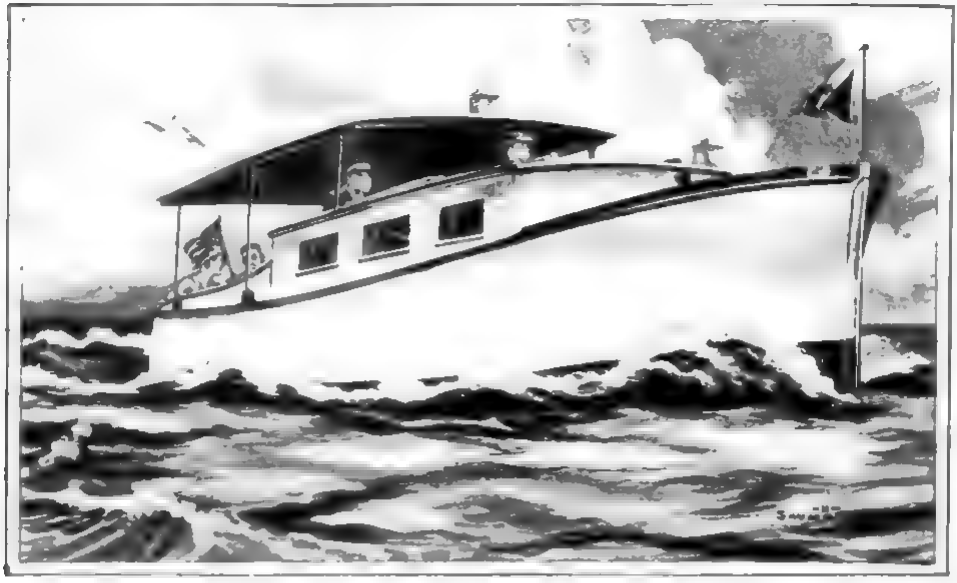

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HELLER'S BOOK OF MAGIC. Magic and [illegible] parlor tricks explained and illustrated. 25c.

TRICKS [illegible] ENTERTAINER. Contains hundreds of simple tricks, illusions, etc. [illegible] Also explains [illegible] Price 25c postpaid.

33 OLD TIME SONGS. A collection of [illegible] with words and full music. Price 25c postpaid.

MIDGET BIBLE

GREAT CURIOSITY. Smallest book in the World. Size of a postage stamp. 96 Pages. Said to bring good luck to the owner. A unique piece of art. Must be seen to be appreciated. Make good money selling them. Friends, [illegible], etc. PRICE 10c each, 3 for 25c, 12 for 75c, 100 for $2.25, 500 for $7.50. Also obtainable in Leather Binding with gold edge. Price 50c each, 3 for $1.25, 12 for $4.50 per doz. Magnifying Glass for use with Midget Bible 15c.

BOOK OF GREAT SECRETS, [illegible] to get rich. It unfolds to you many secrets, methods and [illegible] of marketable articles, many making wrinkles, etc. Price 25c postpaid.

STAGE MONEY

Withanuch of these bills, it is easy for each person of limited means to create great prosperity by flashing a roll of these bills at the proper time and peeling off a genuine bill or two from the outside of the roll the effect created will be found to be all that can be desired. Prices, postpaid: 40 Bills 20c, 120 for 50c, or $3.50 [illegible] postpaid.

NOSE FLUTE

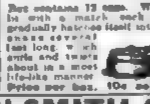
Paid Paid 10c

The Mapes Nose Flute or Humanetone, is a unique and musical instrument that is played with the mouth entirely free as just a little knack in playing it which when once acquired, the little practice will enable you, to produces very sweet genuine [illegible] Practice a few times. There is no fingering and once you have mastered it you can play all kinds of music with facility and ease. When played as an accompaniment to a piano or any other musical instrument, [illegible] is no charming as it [illegible]

WONDERFUL X-RAY TUBE

A wonderful little instrument producing optical illusions both surprising and startling. With it you can see what is especially the bones of your fingers [illegible] and a lead pencil, the [illegible] opening in a pipe stem, and many other peculiar things. Price 10c, 3 for 25c.

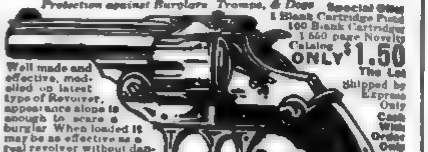
SERPENT'S EGGS



Box contains 12 eggs. When lit each egg gradually hatches itself into a snake several feet long with [illegible] and tongue about in a most life-like manner. Price per box, 10c postpaid 3 for 25c

BLANK CARTRIDGE PISTOL

Protection against Burglars Tramps, & Dogs Special Offer 1 Blank Cartridge Pistol 100 Blank Cartridges 1 660 page Novelty Catalog ONLY $1.50 The Lot Shipped by Express Only Cash with Order Only



Well made and effective, modelled on latest type of Revolver, appearance alone is enough to scare a burglar. When loaded it may be as effective as a real revolver without danger to life. It takes standard 22 cal. Blank Cartridges – obtainable everywhere. Special cash with order offer! 1 Superior quality Blank Cartridge Pistol, 100 Blank Cartridges and our new 550 page De Luxe Catalog of latest novelties; all for ONLY $1.50. Shipped by Express only. Cannot go by parcel post. Extra Blank Cartridges 50c per 100. Special Holster (Cowboy type) for Pistol 50c. No C.O.D. shipments.

Combination Thrift Vault and Savings Bank $1.50

HAS REAL THREE NUMBER COMBINATION LOCK KEYLESS—CANNOT BE PICKED

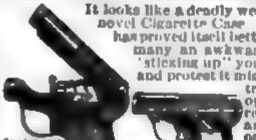
Your money and valuables will be perfectly safe in this new Combination Thrift Vault and Savings Bank, because it has a real combination lock just like the regular Safes and Vaults. The lock requires three numbers to open it. There are over 54,000 different combinations. The lock is pick-proof. It cannot be opened by "listening" for the tumblers is because a special sensitive device locks the safe or vault. It is secure in every sense of the word. No key is required. Once you learn the combination it can be opened in a moment or two. It takes the place of any safe deposit box and is convenient for storing jewelry and other valuable articles and it keeps your private memoranda out of the prying eyes. Coins and currency can be placed in the bank through the post at the top, but the largest coin will not exceed 1¼ inches in diameter. Opening the bank by means of the combination. PRICE with secret instructions for opening $1.50 ppd.

LOOK 35¢ LOOK Wonderful Instrument.

Greatest thing yet. Nine separate articles in one. Everybody delighted with it. Odd, Curious and interesting. Lots of pleasure as well as very useful. It is a double Microscope for examining the wonders of nature. It is also an Opera Glass, a Stereoscope, a Burning Lens, a Reading Glass, a Telescope, a Compass, a pocket Mirror, and a Lamp arrangement for examining eye, ear, nose and throat. It is worth all the cost to locate even one painful cinder in the eye. Folds flat and fits the pocket. Something great—you need one. Don't miss it. Sent by mail. Only 35c or 3 for $1.00

PISTOL CIGARETTE CASE

It looks like a deadly weapon, but it is merely a novel Cigarette Case. This clever contrivance has proved itself better than the real thing in many an awkward encounter. Great fun "sticking up" your friends. They squirm and protest it might be loaded. Pull the trigger and the slide flies open disclosing the cigarettes. Well made, light and compact. Weight only 2 ounces.



Sound of gun's report is the FUN the cigarettes carry. Only 25c postpaid

PRICE POSTPAID 25c

GYROSCOPE TOP

Spins in any position. Defies law of gravitation.

The Gyroscope Top is a popular scientific toy that defies the law of gravitation. The illustration shows how a very few of the steps of spinning it. It can be thrown and caught, rotating rapidly all the time. It will travel along a taut string or wire. You can suspend it from a loop of string and spinning vigorously. It will spin on the point of a pen, and will revolve on a dozen different ways on the pedestal. An effective feat can be performed by spinning the top at a high speed and quickly placing it into the square cardboard packing box. Put on the lid and then set the box on one of its corners. The box will spin around for quite a while presenting a very curious appearance. It is a most instructive novelty always interesting for the many amazing experiments which it sustains find hard to explain. As a scientific instrument it is used to demonstrate the principle of rotation, attraction and equilibrium of bodies in motion, the regulation of gravity and centrifugal force. Placed on the pedestal it illustrates the rotation of the globe better than any other mechanical device. Gyroscopes are used to steer torpedoes, steady ships, to balance monorail trains, and as naval navigation. PRICE JOHNSON SMITH & CO. Dept. 967 RACINE, WIS.

JOHNSON SMITH & CO.

Dept. 967 RACINE, WIS.

A De Luxe Edition of our new CATALOG mailed on receipt of 25c. Handsome binding, bigger and better than ever. Only book of its kind in existence. Nearly 600 pages of all the latest novelties, novelties, novelties, puzzles, games, sporting goods, rubber stamps, unusual and interesting books, curiosities in seeds and plants, etc., [illegible] stamps. Illustrated by Genuine Engravings. Cheerfully refunded if [illegible] Send for [illegible] and Foreign Stamps for all articles listed above. *See next page also*

BOYS! BOYS! BOYS!

THROW YOUR VOICE

Into a trunk, under the bed, under a table, back of the door, into a desk at school, or anywhere. You get lots of fun fooling the teacher, policemen, peddlers, and surprise and fool all your friends besides.

The Ventrilo

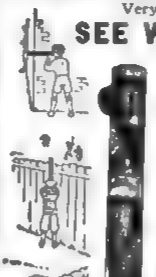
is a little instrument that fits in the mouth out of sight. Cannot be detected. It is used in connection with the above, and with the aid of this wonderful DOUBLE THROAT, or VENTRILO, you can imitate many kinds of birds, animals, etc. Remember you get everything for ONLY TEN CENTS—a booklet giving you full instructions how to become a ventriloquist and throw your voice, the Double Throat, or Ventrilo, and our big catalog of novelties, tricks, puzzles, masks, books, etc.

All Sent Postpaid to Any Address for Only 10c

THE DANDY PERISCOPE

Very Interesting and Amusing Novelty

SEE WITHOUT BEING SEEN



Look Over the Heads of the Tallest Men in a Crowd.

See Over a Fence, Around Corners, Etc.

LOTS OF FUN AND AMUSEMENT

Strongly Made. Equipped with Mirrors, Sight-Finder and Eye-Piece.

THIS is the same kind of instrument that the soldiers use in the trenches to watch the enemy without risk of being seen. The novel and every submarine has one to peep above the surface of the sea to keep a lookout for other vessels, etc. With it you can gaze over a high wall or see around a corner without being seen yourself or if you are in a crowd, you can look right over the heads of the tallest men and see all the fun. Our illustration will give you an idea as to the universal use to which the Periscope can be put. Every Boy should have one for spying and anyone else who wants some real amusement. The Dandy Periscope is very strongly made and will stand the roughest handling and the hardest use and with ordinary use should last a lifetime. It measures 17 inches long and is covered with black cloth. The Periscope Tube and base are decorated with colored designs to show many of its uses, and each Periscope comes complete in box.

Price Postpaid to any Address. **$1.00**

INVISIBLE INK

The most confidential messages can be written with this ink, for the writing makes no mark. Cannot be seen unless you know the secret formula for developing it. Keep your secrets and other private memorandums from prying eyes. Great fun for parties, clubs, etc. Only 15c a Bottle, 3 for 40c.

Rubber Chewing Gum

It is just like a regular package of chewing gum and looks so real that it fools everybody. Of course no one expects it is not genuine until they start to chew it. It is a world of fun to watch the rubber chewing gum — 5 sticks to the package. **Price, 10c Pkg., 3 for 25c, or 12 for 75c postpaid.**

Rubber Tacks	Box 10c	Rubber Cigarettes.	Price per Box, 20c
Rubber Cigars,	Price Ea. 10c	Rubber Matches.	Price per Pkg. 10c

U. S. BABY TANK

25 Cents

It goes with real Yankee Pep—by its own power

Most remarkable toy ever invented. By drawing the Tank backward, either with the hand or over the floor or table surface, then releasing it down, it will crawl along, overcoming all obstacles, in the same lively manner as the larger tank that proved so deadly in the great war. What makes it go is an overhead of a mystery for there is no mechanism to wind up as is usually understood with mechanical toys, yet this tank will keep going along for a long time longer than the ordinary run of toys. It will perform dozens of wonderful stunts, 2½ inches long. **Price only 25c postpaid. Stamps accepted.**

JOHNSON SMITH & CO.

$1.50 ROLMONICA

A Mouth Organ that Plays with a Music Roll

Any One Can Play It Without Practice

A Wide Selection of Rolls to Choose From

A Veritable Pocket Size Jazz-Band!

Rolmonica is an automatic harmonica that plays a music roll just like a player piano. It is a wonderful musical instrument, a necessity of the musical world in the last few years. Anyone can play it, for all you have to do is turn the handle while you blow. That is all there is to it. Nothing could be simpler. Any child who can blow can play the Rolmonica. It is a veritable pocket size Jazz band, as the principles of the harmonica and the player piano (famous instrument of a thousand melodies in player piano parlors of the past, as well as the latest Broadway hits. There are two kinds of rolls to choose from. Popular Music Rolls, Home Sweet Home, Annie Laurie, Old Black Joe, Arkansas Traveler, Sidewalks of New York, Humoresque, Wild Irish Rose, Rose O'Grady, Among My Souvenirs, Love's Old Sweet Song, Dear Old Girl, Lass o' Rose Alpha Or Rose, Ida, Juanita, Rose Marie, Old Oaken Bucket, Sailor's Hornpipe, Carolina Lou, If You Down At Coney, Bonny Rose Over There, My Wife's Gone to the Country, Hurrah! Don't You Believe It, Desert Song, La Paloma, Sweet Adeline, I've Got a Feeling Feeling Feeling, When My Dreams Come True, Parade of Wooden Soldiers, Land of Sleepy Water, Turkey in the Straw, Yankee Doodle All Here and Hundreds of Others. An unfailing source of amusement. You can delight your friends for hours and play the latest popular song hits. Small in size, fitting your pocket, yet mighty in its finer tones, bewitching in its power. Not a toy but a genuine musical instrument and the life of any party. One Roll free with each Rolmonica. Extra Rolls 10c each, or postpaid. Rolmonica is durably made of metal reeds, nickel plated, with hard wood mouthpiece, and is a most desirable musical instrument. New Rolls added each month. **PRICE with 1 Roll $1.50; Extra Rolls 10c each, or postpaid.** Send remittance (Postage Stamps accepted) for all articles listed above, also for our other ad on previous page.

JOHNSON SMITH & CO. Dept. 967 Racine, Wis.

MAGICIAN'S BOX OF TRICKS

Apparatus and Directions for a Number of Mysterious Tricks, Enough for an Entire Evening's Entertainment..... $1.00

ANYONE CAN DO THEM

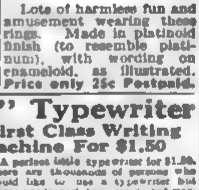
It is great fun mystifying your friends. Get this Conjurer's Cabinet and you will be the envy of every fellow in your district. It contains the apparatus for ten first-class tricks and during the MAGIC BALL AND VASE TRICK a wooden ball is poured inside and upon reopening the lid has unexpectedly found its way to someone else's pocket. The BINDING TRICK CABINET can be made to change privately no less than five times. In APPEARING COIN BOX trick, placed in the wooden box, vanishes entirely of changes into a coin of another denomination. In the GLASS GOBLET TRICK a coin is dropped into a glass of water and when the water is poured out the coin has vanished and is found somewhere else), the RIBBON FACTORY FROM THE MOUTH TRICK (a never empty reeling supply of colored paper ribbon comes out of your mouth), the DISAPPEARING HANDKERCHIEF (a handkerchief held in the hand mysteriously vanishes), the WIZARD'S RING COIN TRICK, the ENCHANTED BOTTLE (no one but yourself is able to make it lay down), the GREAT HAT AND DICE TRICK (a large dice is placed on top of a hat, disappears, and is found underneath yet no one has touched the hat) and last, but not least, the GREAT PHANTOM CARD TRICK, or two from five leaves nothing. Full instructions are given for performing each trick. In addition to the above, a number of other tests and pleasantries fully explained for which you can easily provide the necessary apparatus. **Price complete $1.00 postpaid.** JOHNSON SMITH & CO.

RESURRECTION PLANT

Great curiosity. Place in water, plant opens up and starts to grow in few minutes. Taken out it dries up and goes to sleep until put in water again. **PRICE 10c., 3 for 25c., 75c per dozen, postpaid**

250 MAGIC TRICKS 10c

An excellent little book containing 250 Parlor tricks, such as coin, card, handkerchief, cane, ring, glasses etc. So simple that a child can perform them. Profusely illustrated. Sent postpaid to any address for only 10c, 3 copies for 25c.

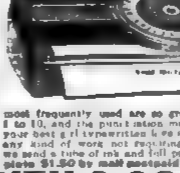


Comical Motto Rings

Lots of harmless fun and amusement wearing these rings. Made in platinoid finish (to resemble platinum), with wording on enameloid, as illustrated. **Price only 25c Postpaid.**

The "Little Giant" Typewriter

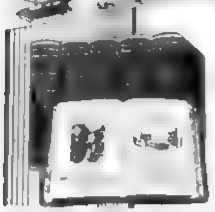
A First Class Writing Machine For $1.50



A perfect little typewriter for $1.50. There are thousands of persons who would like to use a typewriter but whose needs and finances do not warrant the expense attached to the purchase and use of a fifty or one hundred dollar machine. To such persons we cordially recommend our Little Giant. It is strongly made, but simple in construction, so that anyone can quickly learn to operate it and write as rapidly as they would with pen and ink. The letters of the alphabet most frequently used are so grouped as to enable one to write rapidly, the numerals 1 to 10, and the punctuation marks being together. With this machine you can send your best girl typewritten love letters address envelopes, make out bills, and do almost any kind of work not requiring a large stationary machine. With each typewriter we send a tube of ink and full printed instructions for using the machine. **Price complete $1.50 by mail postpaid to any address in the world.** Stamps accepted.

NOW FIX ANY MAKE OF

AUTO



SIX BIG AUTO BOOKS ALL SHIPPED FREE

on approval; whether you want to qualify as garage owner, auto repair expert or merely wish to know how to keep your own car 100% efficient, look at these books—they are sent to you for free examination. This brand new 1931 edition has been prepared by a large group of America's greatest automotive engineers. Anybody who can read will understand them, for this great automobile encyclopedia is a veritable gold mine of valuable facts. Take advantage of this great opportunity now; send in the coupon for FREE examination. You don't pay us a penny, you don't obligate yourself to pay anything unless you decide to keep the books. Just tell us you want to see them and the full set of 6 great volumes, just off the press, will be sent to you. Read them, look them over and prove to your own satisfaction that one fact alone, which you will find in them, may save you an expensive repair, or help you to a better job.

Aviation Motors

In addition to being a complete encyclopedia of automobile engineering, these books contain over 100 pages on Aviation Motors and as they are just off the press they bring to you the newest and latest information obtainable. For these reasons these books are indispensable to anyone.

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Imagine books which are so new that every page is right up to date—wiring diagrams, construction details, service problems—are all right up to the minute. Nowhere else that we know of can you get as complete and up to date information. Over a million dollars of research have been spent to give you the most up to date books on the subject ever published. You will find nearly 20 pages on front wheel drives alone. Everybody interested in automobiles in any way will welcome these books, especially on our no money offer.

Can You Fix It?

Can you take out "play" in differential? Can you kill the "shimmy" in steering? Can you reset TIMING? Can you put your finger on engine trouble without guessing or tinkering? Can you pull the starter off and fix it? Can you adjust an engine, transmission, rear axle bearings?

These Books Tell How

and they tell how to do any and every auto job right, the first time

6 Big Volumes

Nearly 3,000 pages, over 2,000 illustrations, wiring diagrams, equipment charts etc. De Luxe edition with gold-stamped flexible binding. Sent FREE for 10 days' use. If not wanted return express collect. If kept send only $2 after 10 days, then $3 a month until special advertising price, $24.80, is paid.

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Privilege of consulting engineers of million-dollar American Technical Society on any automotive problem for one year without charge, if you mail coupon immediately

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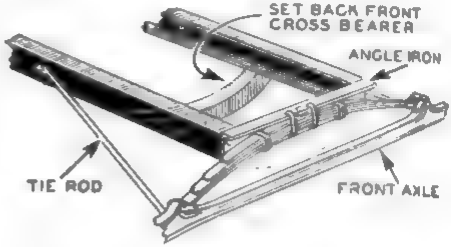
These books sent free for examination to anyone sending name and address and that of his employer

ANDY'S SHOP MAIL BOX

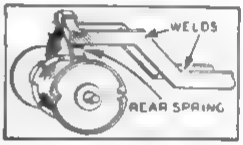
(Continued from page 28)

the front system six inches, and it looks like this:



Next place an extra Ford front motor frame bearer 14" back, and bolt to the under side. Cut off the torque tube 18" and heat and flatten out the rear spring to lower the rear end. If preferred, a kick-up like the larger makes of cars use may be fashioned by cutting and welding the frame thus:

Use a cam and lever steering system with the curved steering arm from a bigger car welded to the Ford left spindle. The system is bolted to the frame and the steering shaft angled over until the steering wheel is in the center line of the car.



The next job is rebuilding the motor. Take it all apart. Drill the crankshaft for full pressure feed, balance the rods, trim down the pistons on a lathe or install aluminum pistons. Grind the camshaft for a quick drop. Braze a piece of sheet steel to the lower crankcase opposite the rear main bearing to block the oil from entering the flywheel housing and original oil sump. Make a new sump by brazing a 2-gal. can to the removable oil pan and bore several holes through to allow the oil to drain into the sump.

Attach a Chevrolet oil pump to the end of the crankshaft and run the intake line to the new sump. Run the pressure lines along the side and through the block to each main bearing, and a fifth line to the oil pressure gauge.

A Dodge water pump can be attached so as to run where the generator was formerly placed, using the old generator gear on the pump shaft.

The magneto can be attached to the front end of the crankshaft with a shaft running through the crank hole and a sheet steel bracket to support the mag. The magneto is timed on advance, 7/16" early on piston travel and runs at crankshaft speed.

In the transmission, turn down the flywheel to a diameter of ten inches, remove the reverse drum, and if higher speed is wanted, sacrifice the low gear drum with its attendant parts.

(Continued on page 38)

LET ME PROVE IN 7 DAYS

that I can make YOU a NEW MAN!

CHARLES ATLAS
As He Is Today

Holder of the title of "The World's Most Perfectly Developed Man," awarded in international contest, with ALL strong men willing to compete with him. His own modern method of *Dynamic Tension* developed him from a 97 pound weakling to the physical ideal of health and strength shown in this new photo.

By CHARLES ATLAS
Holder of the title:
"The World's Most Perfectly Developed Man"

ALL I want is *one week* to prove that I can give you a powerful body of might and muscle like mine—with my quick *Dynamic-Tension* method.

Here's all you do:

Just jot down your name and address on the coupon below, mail it to me—and I'll send you, absolutely free, a copy of my new book, *"Everlasting Health and Strength."* It reveals the secrets that turned me from a 97 pound, flat-chested weakling into a husky fellow who won the title of "The World's Most Perfectly Developed Man" against all comers! And it shows how I can build *you* into an "Atlas Champion" the same easy way.

It tells the fascinating story of how I've taken underdeveloped, flabby, no muscle men of all ages and given them big powerful muscles, increased measurements all over, amazing strength, endurance, vitality and pep—all in a few minutes of spare time daily at home.

Thousands of fellows all over the world have used my methods—and now *you can too.* Like them, you can put on firm layers of muscle where you need it most, tone up your whole system, banish constipation, poor digestion, bad breath, pimples and other ailments that rob you of the good things and good times of life, and get the "drive" that'll take you to the top of the ladder.

Easy My Way

I haven't any use for apparatus; I don't dose you or doctor you. *Dynamic-Tension* is all I need. It's the *natural*, tested method for developing real men inside and out. It distributes added pounds of powerful muscles over your body, gets rid of ailments and surplus fat, and gives you the vitality, strength and pep that win you the admiration of every woman and the respect of any man.

Accept My FREE BOOK

Why be only 50% of the man you can be? Send NOW for a free copy of my new large illustrated book loaded with pictures of myself and others who have used my secret methods. Read what I did for *them.* And find out what I can do for *YOU!* Don't put off becoming the husky, big muscled NEW MAN you can be! Mail the coupon TODAY.

Address me personally, CHARLES ATLAS, Dept 6J, 133 East 23rd Street, New York City.

FREE BOOK

My large illustrated book, "Everlasting Health and Strength" has shown 20,000 others the way to big muscles and strong, healthy bodies. Send for your copy NOW.

CHARLES ATLAS, Dept. 6J,
133 East 23rd Street, New York City.

I want the proof that your system of *Dynamic Tension* will give me, too, a healthy, husky body and big muscle development. Send me your free book, *"Everlasting Health and Strength."*

Name .....
(Please print or write plainly)

Address .....

City ..... State .....

ANDY'S SHOP MAIL BOX

(Continued from page 36)

A radiator is made by cutting three sets of tubes from each side of a stock Ford radiator, and trimming and soldering the water tank to conform.

A cowling can be shaped from sheet steel, about 22 gauge, and placed over an angle iron framework with wooden dashboards. A gas tank can be put under the cowling or on the tail. The cowling is a little narrower than the frame, and for simplicity a bucket seat can be made and attached; or a more elaborate wedge-shaped tail can be put on. Buy a set of wire wheels, with threaded hubs for quick removal.

I will be glad to help anyone with all the information I have been able to collect, which is not so much.

Yours truly,

DONALD LOCKWOOD.

A model plane built by Hudson Keith, who lives at 5133 Sheridan Avenue, Minneapolis, Minnesota

A New Book

HOW do you like my unique method of literary criticism? O, yeah? Well, anyway, I've just discovered another book which is just what us grease monks need. It's called the AIRCRAFT MECHANICS' HANDBOOK, and the McGraw-Hill Book Company only wants two bucks for it. The volume was written by Lieutenant I. W. Miller of the U. S. Marine Corps, and as I was a Leatherneck myself for quite a spell, I'm glad to give it a boost.

But I'd really have to boost it anyway, even if it wasn't written by a fellow Gyrene, for it contains dope which you and I really ought to have at our fingertips. There comes a time in every mechanic's life when he needs a reference book, and here's one that is compact enough to keep on your workbench without being in the way.

Society Girl Wants A New Name

Social Position Demands Change In Name As Popular Beauty's Photo Appears In National Advertising

CINCINNATI, Ohio (Tuesday)—Few people dodge fame yet that is the wish of a local debutante whose photo has recently ... is to be featured in national magazines throughout America. A large cash prize is to be given the person suggesting the name which will be featured with the photograph ...

Give This Girl a Name

This popular and beautiful society girl has been chosen to sponsor a line of nationally sold Beauty Preparations. Because of her social position she must use another name. Suggest a winning name for her—*a first and last name*—and win a cash prize. Just some simple name that is easy to say and easy to remember.

On This Day $250.00 Just for a Girl's Name

COSTS NOTHING TO WIN

Nothing to Buy—Nothing to Sell—No Puzzles, "Lucky Numbers" or "Guessing Contests" to Win This Cash Prize

JUST SUGGEST A GIRL'S NAME

Here's an amazing opportunity to win a big cash prize for just a moments time. Simply send us a name for this beautiful society girl—a name that you think would sound nice in a Magazine advertisement. We have chosen this society girl to sponsor a new line of Beauty Preparations. Her picture will appear in our advertisements. But because of her social position she cannot use her real name. We are going to pay a big cash prize just for a winning name. Think of a name—send it to us TODAY—Win $250.00 cash and qualify for an opportunity to win *further prizes of $2,600.00 or Buick 8 Cylinder Sedan and $1,100.00 Cash for promptness* in the simple way we show you. See rules below.

YOU CAN'T LOSE

Nothing to lose—costs nothing to win. It is easy to think of a name. Some name that may flash into your mind this very instant may win the prize. Just some simple name like Helen Miller or Mary Lee may be chosen as the prize winner. Don't let this opportunity slip through your fingers. Think of a name NOW—send it TODAY.

JUST SENDING A NAME QUALIFIES YOU FOR OPPORTUNITY TO

Win $2,600.00 *or* Buick 8 Sedan

and $1,100.00 *for* Promptness

This huge prize is *Extra* and *in addition* to the cash prize for the Society Girl's name. No wonder we say that here is your opportunity to win a fortune. Think of it! $2,600.00 all cash or a big Buick 8 cylinder Sedan and $1,100.00 in cash besides—all coming to you at once! Many work a lifetime without ever getting together such a magnificent sum. Hundreds of prizes—over $4,300.00 in cash will be given in this huge prize distribution. Some yet unknown person is going to win a fortune—why not you? You have just as good a chance as anyone. *Every single person who takes an active part will be rewarded in cash.* Just send a name suggestion to qualify for this opportunity of a lifetime—nothing more to do to qualify. But act at once—remember $1,100.00 Extra is given for promptness.

SEND NO MONEY You don't have to send any money, you don't have to buy anything or sell anything to win the Name Prize. Just send the first name you think of—it may be a winner—it has just as good a chance as any. But do it NOW! Rush letter with name suggestion or send coupon at once. I will answer at once giving you all the details and telling you just how you stand in the distribution of $4,300.00 cash prizes. Here may be the means of making you financially independent for life.

TED ADAMS, Manager

906 Sycamore St. Dept. 535-JJ Cincinnati, Ohio

NAMING CONTEST RULES

Contest open to everyone except employees of our company. Only one name may be submitted. Sending more than one name will cause all names sent by you to be thrown out. Prize of $250.00 will be awarded to one name of all those submitted. In case of duplicate winning names, duplicate prizes will be given. Contest closes October 15, 1931. Every person sending name qualifies for opportunity to win $2,600.00 or Buick 8 Sedan and $1,100.00 cash for promptness. Use the coupon or write letter for all details.

C O U P O N

TED ADAMS, Manager
906 Sycamore St., Dept. 535-JJ Cincinnati, Ohio

My suggestion for the Society Girl's Name is:....

.....

My Name .....

Address .....

City ..... State .....

I am interested in winning $2,600.00. Rush me all information and tell me how I stand.

Uncle Sam's Amazing

In covering the framework of the Akron, linen airplane fabric is used, coated with airplane dope.

by DR. KARL ARNSTEIN

(Vice President and Chief Engineer, Goodyear Zeppelin Corp.)

As told to JAY EARLE MILLER

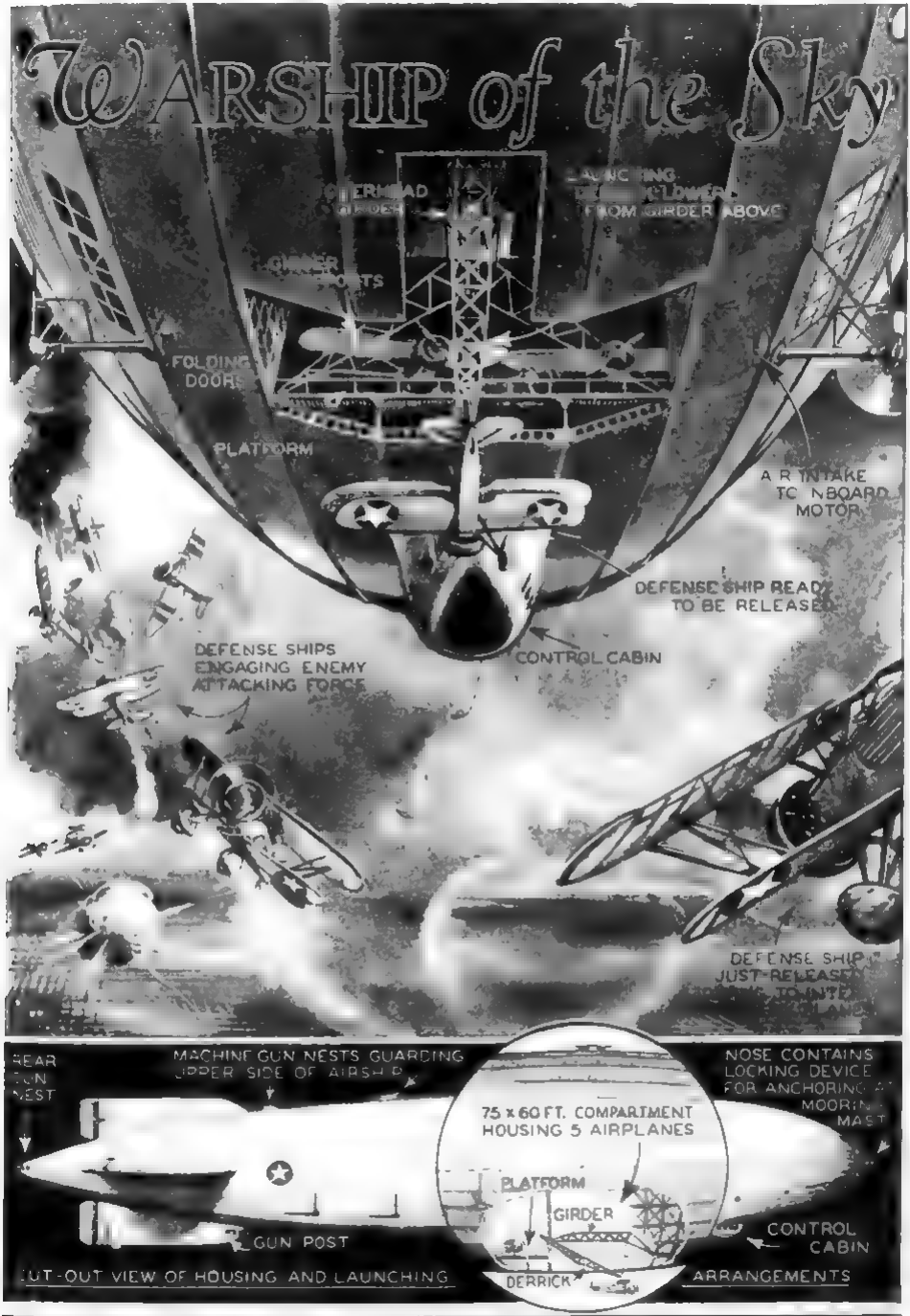
The biggest airship in the world, an amazing structure which is veritably a flying battleship, is practically finished and ready for test flights by the U. S. Navy. The man who supervised the design of this warship of the sky reveals here the fascinating mechanical details of its construction.

ABOUT the time this article appears in print the largest lighter-than-air ship ever built—the 6,500,000 cubic feet *Akron* will be walked out of the world's largest airship dock, or hangar, for its initial trial flight.

When the *Akron* takes to the air, the dream of Count Zeppelin—a super-airship capable of taking its place in world commerce—will have been realized. Not that the *Akron* is such a ship, for it is purely a military craft, a sort of flying battleship, built for scouting work with the fleet at sea, but it contains within it all the essentials which the coming trans-oceanic air liners will need, save actual passenger compartments.

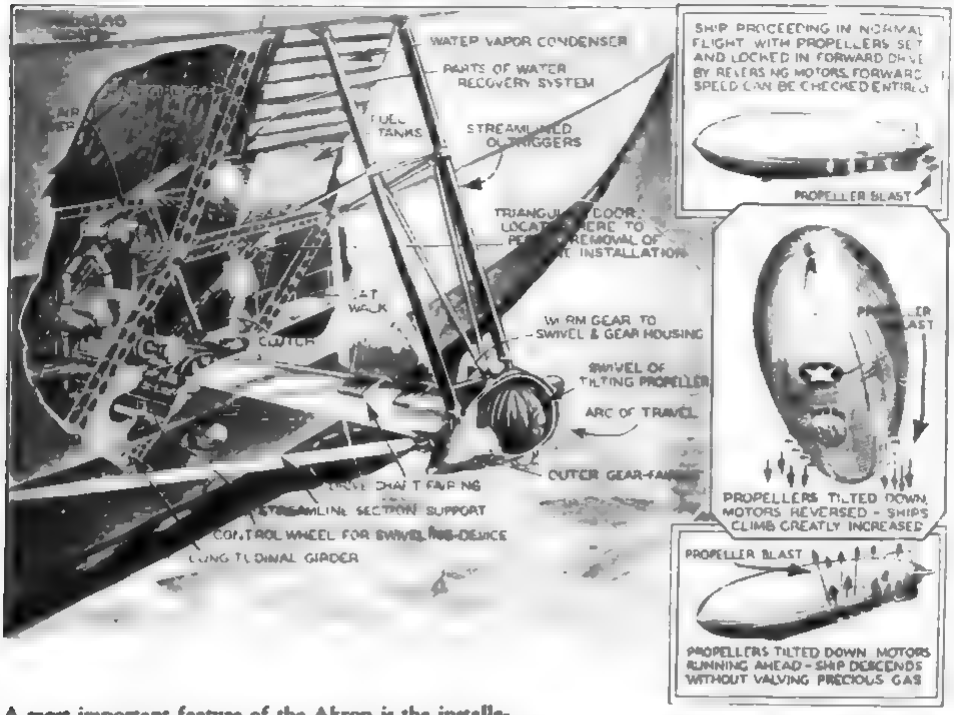
It has the size and the power to ride out storms and maintain regular and fast service, the scientifically calculated strength to withstand extreme air conditions which may be encountered and the safety features only possible in American built ships inflated with American helium.

Aside from the new methods in construction, the outstanding feature of the *Akron* will be the hangar built within the hull to house five scouting and pursuit airplanes, both to supplement her scouting activities and to aid in her defense if attacked by enemy planes. A truss built between the main frames in the second bay aft of the control car is placed directly above a "T" shaped door opening in the bottom of the



Essential features of the airplane launching device and arrangement of defending guns of the Akron are pictured here. The airship is a self-sufficient flying unit with an unusually wide cruising range.

'Fat' Design of Akron Increases Gas Capacity, Gives Better Streamlining



A most important feature of the Akron is the installation of motors inside the bag, made possible by the use of non-explosive helium gas for inflation. Note the advantages gained through the use of swiveling propellers, which travel through 90 degrees of arc.

fabric covering. Through this opening a trapeze will be lowered, and the airplanes, with a hook above their upper wing, will fly up and make contact, as has been done many times in experiments with the *Los Angeles*. After they have attached themselves the planes will be drawn up within the hull and hung up in storage from the supporting truss. The airplane compartment, 75 feet long and 60 feet wide, will provide space for five airplanes.

Airplanes and armament are to be provided by the navy department, but the original plans called for gun nests in the nose and tail, on top of the hull above the control car, in either side amidships, and in the leading edge of both the vertical stabilizing fins, above and below the hull. The lower fin also is to contain an emergency steering station for use in event of the failure of the cables from the control car. Provision also is made for one or two basket cars, which may be lowered by cables from the ship, flying above the clouds, permitting observers to be lowered below the clouds, from where they can direct operations by telephone.

The ZRS-4 (the official designation of the ship pending her launching and naming) is one of two sister ships ordered by the U. S. Navy department from the Goodyear-Zeppelin Corporation of Akron, Ohio, and the name selected for the first one built is a tribute to its birthplace. In size, which, in lighter-than-air ships means lifting gas capacity, the ZRS-4 and ZRS-5 will each be nearly twice as large as the *Graf Zeppelin* and considerably more than two and a half times as large as the Navy's *Los Angeles*. The latter has a gas capacity of 2,470,000 cubic feet, the *Graf Zeppelin* has 3,700,000, and the two American ships will each contain 6,500,000 cubic feet of lifting gas. They will be about 35% larger than the 5,000,000 cubic foot R-100 and R-101, built in England.

Despite the vast increase in size, the *Akron* is only 15 feet longer than the *Graf*

To test the efficiency of the swiveling propeller, a section of the Akron's framework was erected outdoors as shown above and the motor run for 50 hours to make sure there were no "bugs."

Zeppelin, but 34 feet greater in diameter. Those dimensions, 785 feet long by 132.9 feet in diameter, makes the *Akron* a fatter, more rounded ship, a contour that has marked advantages. The slim lines of the *Graf*, the *Los Angeles* and the German war-time Zeppelins, were not dictated by aerodynamical considerations so much as by limited hangar space in which to build them, and, in the case of the "lead pencil" shaped war-time ships, considerations of quantity production. Volume for volume the surface of a fatter ship offers less frictional resistance to the air, but the greater diameter causes an increased form drag. Tests have shown that the advantages of fatness reach their height in comparison to the disadvantages of form resistance when the length is somewhere between five to seven and a half times the diameter, so the fineness ratio of the ZRS-4 of 5.9 comes well within those limits, and is much superior to the 7.7 ratio of the *Graf Zeppelin*.

The outstanding features of the American ships, however, is a vastly improved

Inside the sphere at the base of the propeller shaft are housed the bevel gears which are the heart of the swiveling device.

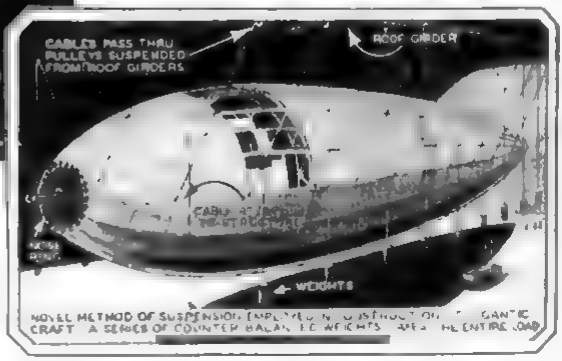
Graphic comparison of the Akron with the Los Angeles and Graf Zeppelin reveals striking differences in size and proportion. Although the Graf Zeppelin is practically the same length as the Akron, it has slightly more than half the gas capacity. At right is shown the method of suspending the Akron from the hangar roof by counterbalanced weights.

form of construction made possible by their size, and the elimination of exterior power cars in favor of engine rooms built within the hull, made possible by the use of non-explosive, inert helium gas instead of the dangerous hydrogen.

To understand how we have improved the form of construction it is necessary to consider the evolution of the Zeppelin design. Airships built to Count Zeppelin's triple layer principle—which means a series of separate gas cells, a rigid framework to confine them and support the load, and an outer covering to protect the other members against the weather and furnish a smooth flying surface—fall naturally into three classes, which might be called small, medium, and large ships.

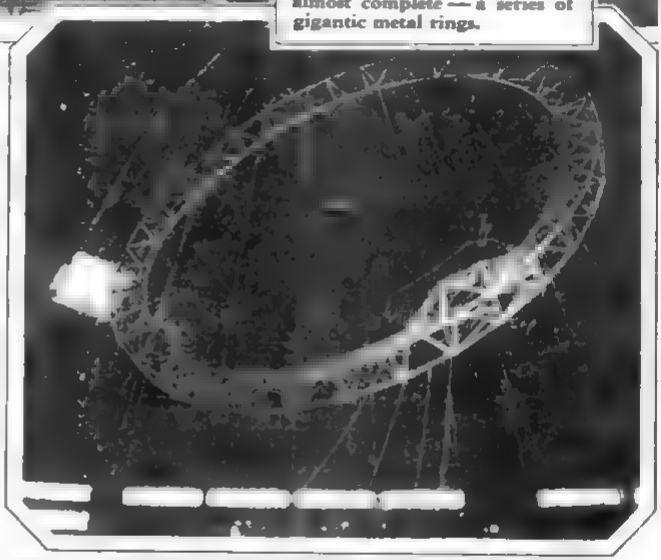
The *Bodensee*, built at Friederichshafen in 1919 for passenger purposes, is typical of the smaller class, the *Los Angeles*, built in Germany for the U. S. Navy of the medium type, and the new naval ships are of the larger type. In the smaller class the hull is a series of main transverse girders, rigidly braced within their plane by a system of cross wires, holding together all the corners. One of these main girders or rings is placed between each pair of gas cells, and they are joined by longitudinal rib girders, which in turn are strengthened by intermediate rings between the main girders. In the *Bodensee* the main rings were seventeen-sided polygons, with from three to four bracing wires extending from each of the corners where two sides were joined. One of the seventeen sides was placed horizontally at the bottom to form the floor of the corridor.

In the *Los Angeles* the main frames were 22-sided polygons, developed from regular



Above is seen one gas cell of the Akron inflated, with a free balloon in foreground. The criss-cross lines show where the restraining wires press against the cell.

The skeleton of the Akron almost complete — a series of gigantic metal rings.



Lifting the first ring of the Akron's frame into position. It was suspended from the roof, other rings raised, and the series joined together by longitudinal girders pressed out of duralumin metal.

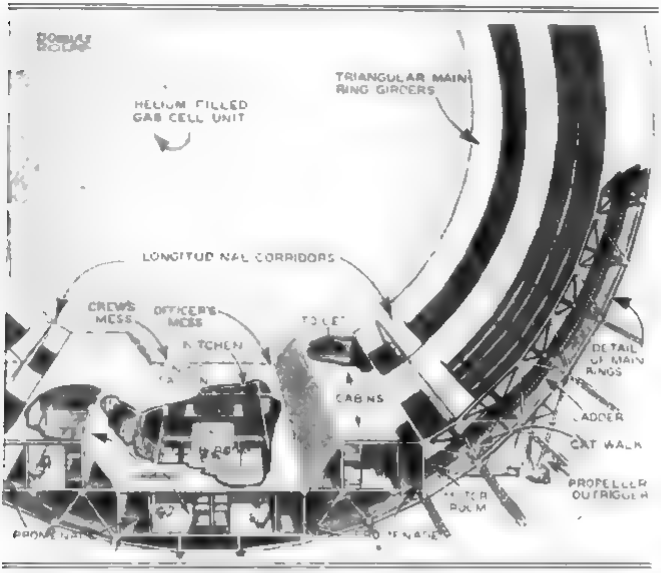
24-sided figures by extending the second sides from the bottom downward until they met. Because the angles between two sides were quite obtuse, and a wire-braced figure with such angles and so many sides would be too sensitive, each pair of sides was braced with a simple diamond truss, and the alternate corners, at the truss ends, wire braced.

The wire bracing in the main frames of a Zeppelin serves two purposes. It braces and strengthens the girder rings, and it also acts as a bulkhead to retain the gas cells in place. But when one gas cell is partially deflated the adjoining cell presses the wire bulkhead outward, and thus exerts a considerable strain on the girder.

In the new American naval ships we have adopted a new form of construction, with main girders inherently strong and requiring no wire bracing. A wire network of somewhat different pattern is used, but it is fitted somewhat loosely so that it may give under the pressure of the gas cell without exerting a strain against the framework. The new type of main girder consists of three rings, two equal to the outer diameter of the ship at that point, and the third, somewhat smaller, mounted within the hull and braced in a zigzag fashion with truss members to form a ring with triangular cross section. The triangle within the three rings is large enough to hold a corridor, and each of these main frames contains a catwalk and ladder system extending entirely around the ship, so that members of the crew can reach any point.

Next, instead of placing a keel at the bottom, we have three keels extending the length of the ship, one at the top and the other two on either side, about 45 degrees

Three Keels Give Strength to Dirigible Frame



This cross-sectional drawing shows the essential structural details of the Akron. The arrangement of cabins, however, is a suggested one for commercial airships and incorporates no military ideas.

from the bottom. The framework of the three keels and the similar framing of the main transverse members forms a rigid whole, which requires no wire bracing. Between the main rings the usual intermediate girders are placed, to carry the ends of the short lengths of longitudinal ribs, and help confine the gas cells. There is a fourth keel, within the bottom of the hull, extending from the control car forward to the mooring mast door in the nose.

Our ability to place the eight 560 h.p. Maybach engines in roomy engine rooms within the hulls, made possible partly by the use of inert helium and partly by the location of the side corridors, is one of the most interesting developments in the new ships. It eliminates all air resistance from exposed power cars, it gives us roomy engine quarters in which a complete overhaul can be undertaken, if necessary, while in flight, it gives us a simple form of geared propeller arrangement which makes possible slower and more efficient propellers, and, finally, the fact that the propellers are driven by bevel gears at the ends of the outboard shafts, makes it possible to swivel the propellers around through 90 degrees of arc. Thus, by utilizing the reversible feature of our engines, we can direct the propeller blast downward to increase the lift of the ship, or we can turn it upward to force the ship downward without the valving of the precious helium gas. The bevel gearing at the end of each transmission shaft is enclosed within a spherical housing, which in turn is built within an outer, streamlined cover, which, with the streamlined cover over the transmission shaft, is rigidly attached to the hull and braced with suitable struts. On the inner spherical housing there is a worm wheel, the worm of which is turned by a shaft terminating in a hand wheel within the engine room. As the worm is self-locking it is easily set and remains fixed in any position.

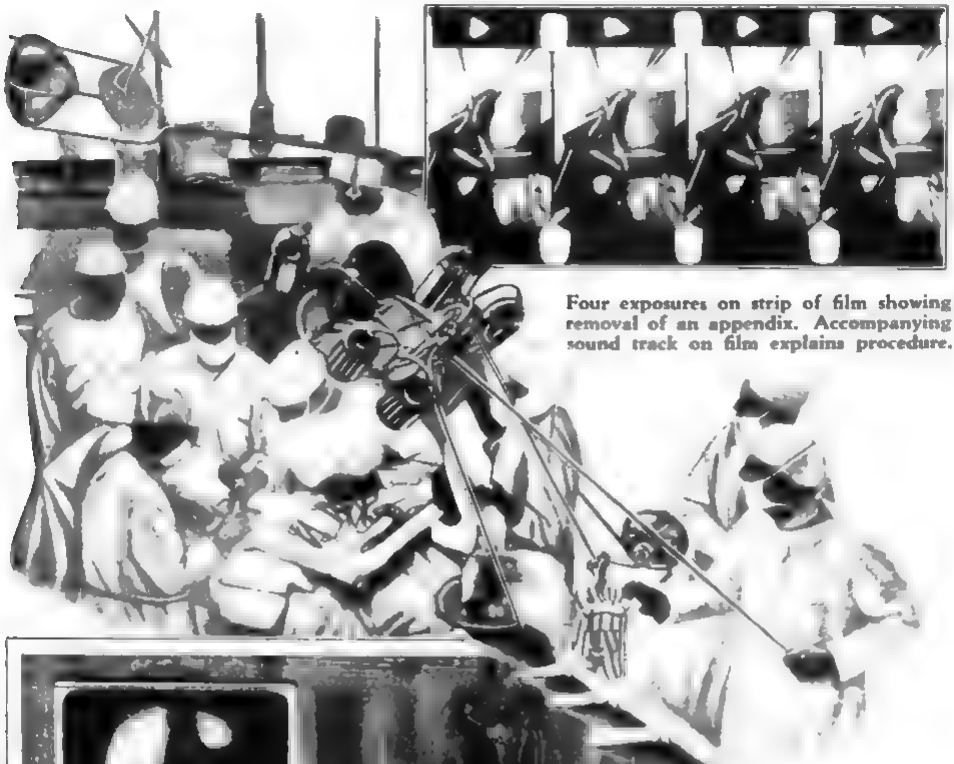
The new ships are equipped with a water recovery system which extracts water from the exhaust gases to replace the weight of the fuel consumed—an important feature, as otherwise a ship becomes lighter in flight, and it would be necessary to valve lifting gas to compensate for the weight of fuel consumed. A peculiar thing about the water recovery system is that it sometimes extracts more water from the exhaust than the weight of fuel burned, the recovery under certain conditions of temperature and humidity being as much as 140%. As a result we can not only replace the lost weight of fuel, but actually put water back into the ballast bags to replace that used in maneuvering.

In the *Akron* we pre-cool the exhaust gas before it reaches the water vapor condensers, which are set flush with the hull, with only thin longitudinal ribs projecting. A cold air intake leads up over the exhaust manifold, surrounding the exhaust stack. Above the engine there is a blower, driven by a belt from the main transmission shaft, the blower providing circulation for the cooling air. In cold weather the heated air from the blower is piped to the

(Continued on page 182)

MOVIES Aid Study of SURGERY

Four exposures on strip of film showing removal of an appendix. Accompanying sound track on film explains procedure.



A movie camera, operated by remote control, "shooting" operation.

Group of surgeons watching and listening to movies of human vocal cords.

THAT motion pictures are rapidly coming to the front as an aid of great importance in modern medicine and surgery is evinced in the recent introduction of the movie camera into the operating room, photographing every minute detail of a surgical operation. When reproduced on a screen, the pictures enable students in colleges and hospitals, as well as surgeons throughout the world, to witness as if on the spot the rare and delicate operations performed by renowned specialists. The movie camera, with the talkie recording apparatus, is mounted on an arm over the operating table as demonstrated in an accompanying photograph.

POST-GATTY Flight

The Winnie Mae on the runway at the Harbor Grace airport just before taking off on the perilous Atlantic hop.

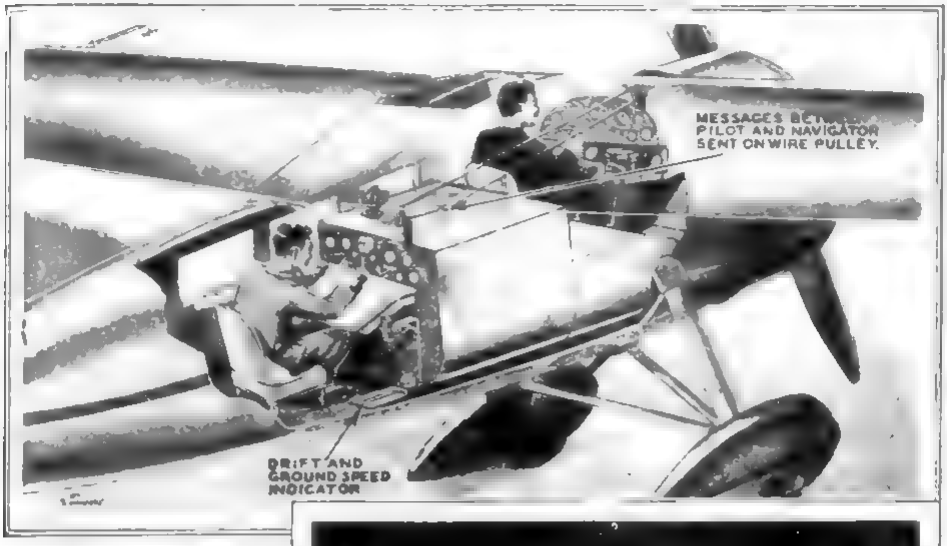
Wiley Post (left) and Harold Gatty being congratulated by F. C. Hall, their backer, after their record-smashing flight around the world.

IF WILEY POST had swum the English Channel in four hours and Harold Gatty had run a mile in two minutes, the world could not have been more startled than it was when it beheld the apparent ease with which this unbeatable combination of pilot and navigator circled the globe in eight days, 15 hours and 51 minutes, to clip more than thirteen days from the record of the *Graf Zeppelin*.

The public acclaim for this epoch-making flight deservedly goes to Post and Gatty for their courage, skill and stamina in piloting the *Winnie Mae* over two oceans and continents, taking the weather as they found it and keeping ahead of a strenuous schedule in spite of all obstacles.

But more important to aviation is the proof that planes, engines, and instruments have reached the point where schedule flights between continents may be made without waiting for perfect weather conditions. The sturdy 425 h.p. Wasp motor, which received almost no attention during the flight, was pronounced capable of going an equal distance again without overhaul. The engine manufacturers warned Post that the Wasp, with its 10-1 compression, would not perform without ethyl gas, and this fuel was unobtainable in Siberia. Post proved that the motor would work nicely on ordinary gas. The Lockheed-Vega plane, which was a stock ship with over 300 hours of flying behind it before the flight was attempted, came through with no damage

is Aviation's Greatest Feat



A phantom sketch of the interior arrangements of the Winnie Mae. The gas tank separated pilot and navigator.

The Winnie Mae taxiing to a stop after landing at Roosevelt field upon completion of the round-the-world flight in less than nine days.

other than a few dents in the streamlined wheel pants, this happening when the plane got stuck in Siberian mud.

Harold Gatty, whom Lindbergh says is the finest navigator in the world, used this flight to test his newly invented ground speed and drift indicator. This device consists of a telescopic eye-piece through which the navigator can see land, sea or clouds through a pane of glass in the floor of the plane. Across the glass a film, cut across with fine parallel lines, is moved to synchronize with the speed of the object sighted below. With the distance to the object and the speed of the film known, the ground speed is obtained.

The arrangement of the ship, despite the large amount of space taken by the tanks for gas and oil, was cleverly handled. Under Post's seat was a tank for the oil. Immediately behind him was the large gasoline tank supplementing the regular wing tanks of the Lockheed.

Gatty's chair was immediately behind the large gas tank. All of the instruments necessary for navigation were at eye level in front of him, while the drift and ground speed indicator was at his right on the floor of the fuselage. His maps and charts were disposed in pockets under a folding table in front of his seat and hinged to the back of the large gas tank. Gatty was able to make his celestial observations from the rear seat.

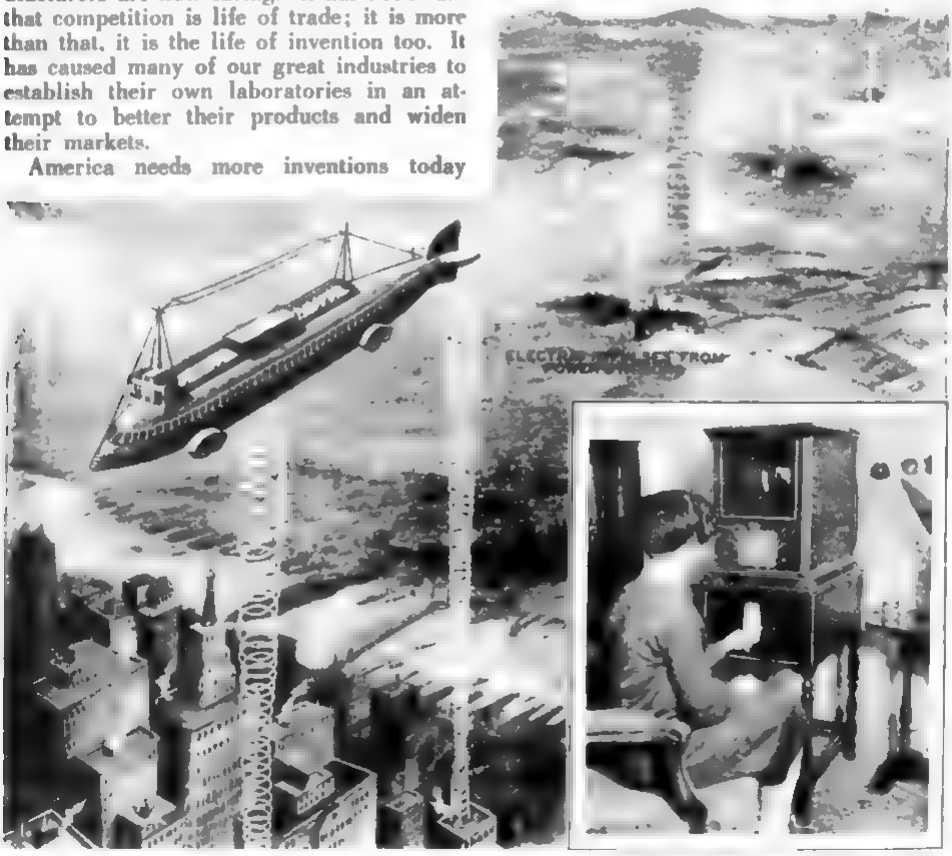
Wanted—Ten Billion-

by RAYMOND FRANCIS YATES

What are the inventions of tomorrow which will be worth billions of dollars to industry? Mr. Yates, member of the Institute of Radio Engineers and well-known writer on scientific subjects, here describes ten billion-dollar ideas. It will be interesting to make your own list and compare it with that of Mr. Yates.

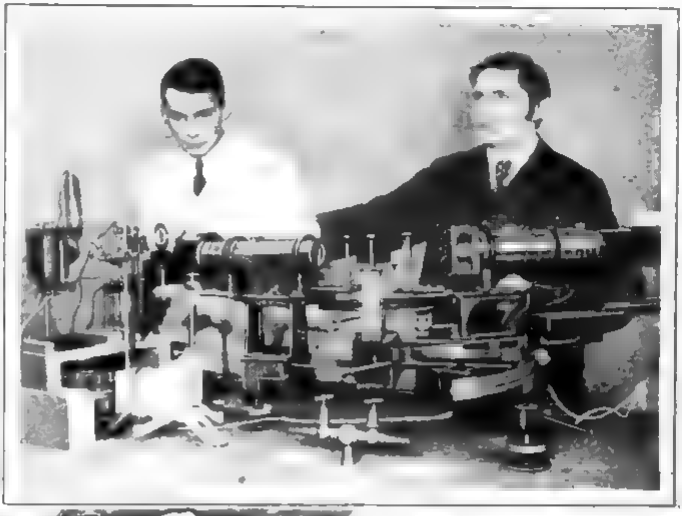
THERE is at hand a new day of big rewards for inventors; rewards larger than dared to be dreamed of years ago. America is particularly anxious to stimulate its genius by the payment of huge sums of money to those who can solve the industrial problems that many of our large manufacturers are now facing. It has been said that competition is life of trade; it is more than that, it is the life of invention too. It has caused many of our great industries to establish their own laboratories in an attempt to better their products and widen their markets.

America needs more inventions today than it ever needed before and thousands of professional inventors have been hired to find these new things; these market builders. However, this, contrary to current opinion, does not mean that the independent inventor is no longer a factor or that his efforts are no longer needed. The

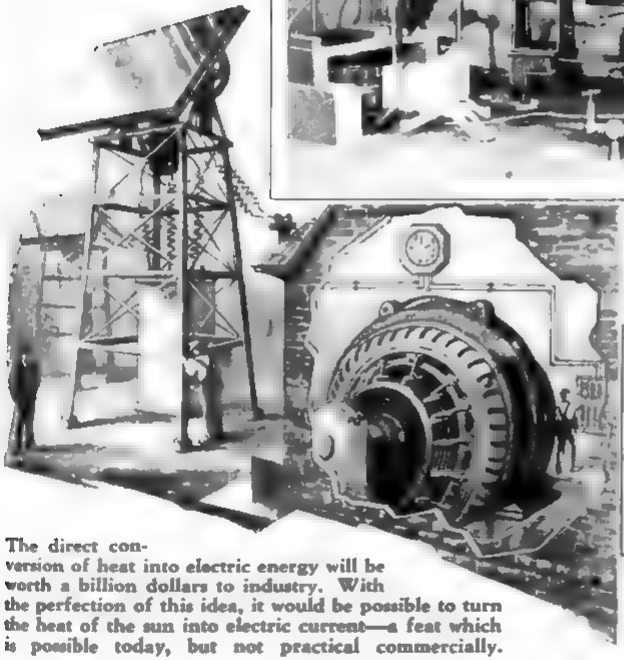


Electro-magnetic levitation, in which passenger cars are supported above the earth by electric impulses, is a billion-dollar transportation idea. Perfection of television likewise falls into the billion-dollar class.

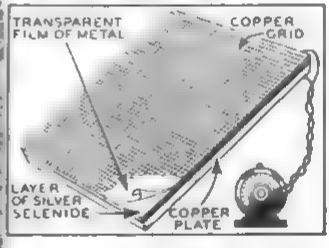
Dollar INVENTIONS



At right above is Dr. Bruno Lange, German scientist who has succeeded in producing current from sunlight, in the manner diagrammed below.



The direct conversion of heat into electric energy will be worth a billion dollars to industry. With the perfection of this idea, it would be possible to turn the heat of the sun into electric current—a feat which is possible today, but not practical commercially.

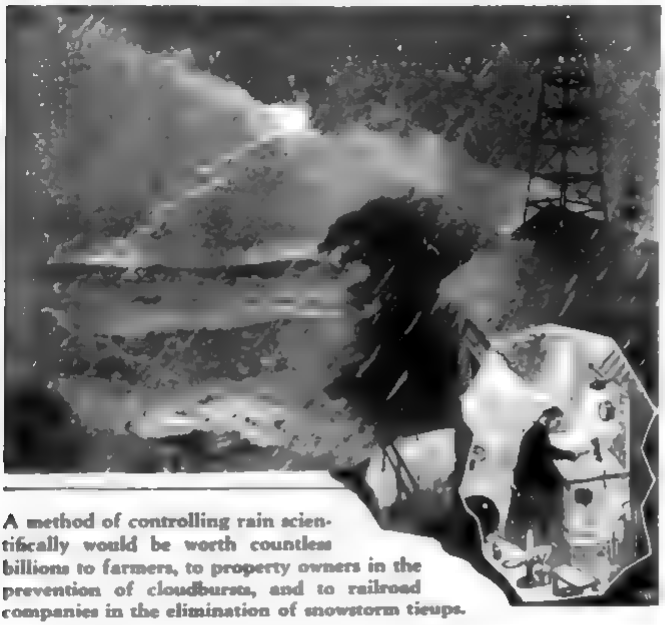


Two metal plates, separated by a layer of silver selenide, produce an electric current when exposed to the heat of the sun.

records of the patent office prove quite the opposite. Manufacturers want ideas and they don't care where they come from. The fact that many of them have established their own laboratories just goes to show how tightly pressed they have been; how keenly they feel the onslaught of competition.

A short time ago the writer sat in the lounge room of a club. Two chemists, an electrical engineer, a mechanical engineer and a business man were present. The conversation drifted to invention and research and the business man finally asked those present to name what they thought were the outstanding problems of the day; to name what he was pleased to call "ten one-billion dollar ideas". At first there was some dissension but as the conversation wore on, agreement was at last reached and ten problems really in the billion-dollar class were laid down. It was not thought that inventors would receive this amount for their ideas. Rather, it was merely believed that the successful solution of the problems would be worth a billion dollars each to the industry to which they were related.

The first problem discussed had to do



A method of controlling rain scientifically would be worth countless billions to farmers, to property owners in the prevention of cloudbursts, and to railroad companies in the elimination of snowstorm tieups.

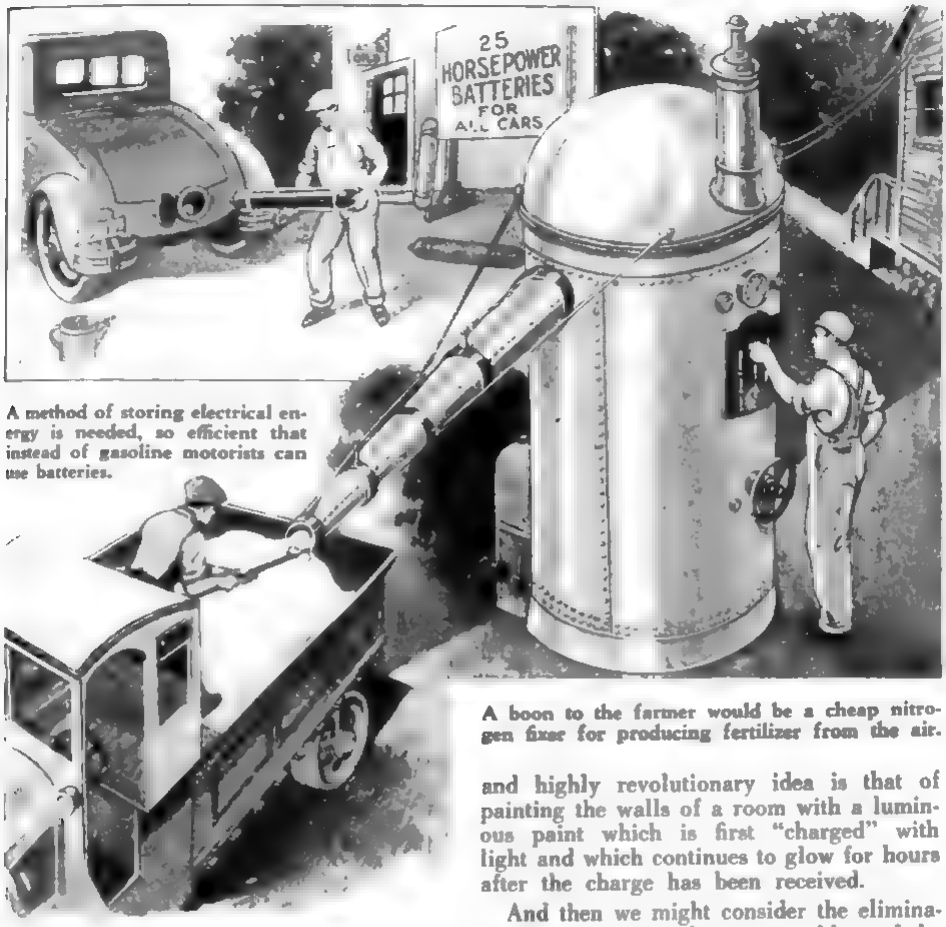
with a new source of power. Atomic energy was ruled out as being visionary and at present utterly beyond control, even if it could be produced. Also a substitute for gasoline was ruled out. Such substitutes are known but they have not as yet destroyed our gasoline markets nor do they jeopardize the millions that our gasoline manufacturers have invested in their refineries. It was decided, however, that electricity offers the most convenient, the most reliable and the most flexible means of power. What is needed is a cheap and effective means of storing large quantities of electricity in small light weight containers. Let us assume that a storage battery of new type is invented that will deliver a power of 25 horses for a period of 48 hours. What would this mean to transportation? What would this mean eventually to our gasoline market? In place of taking on ten gallons of gasoline at the gas station, we would simply take on a new container of electricity. During the night, when the service load on the public utility mains was relieved, current could be used to recharge such containers. Even such great water falls as Niagara might be "turned off" during the night and the power generated (some 7,000,000 horsepower) be used in this manner.

The electric automobile would be the ideal. Silent, fast and with a flexibility that can never be hoped to be reached in the gas car. Not only that, but it would be free of gas and it would require only an insignificant percentage of the lubrication needed for the gas machine. Surely that would be a billion dollar idea, and conservatively rated at that.

The discussion of this idea suggested the second billion dollar invention; the direct conversion of the heat from coal and other fuels into electric energy. At the present time, we burn coal, produce steam and permit the steam to expand in either a turbine or a steam engine. This is a very wasteful process and one that costs us many billions of dollars annually. It has been known for many years that when two dissimilar metals are brought together and heated at the points of their conjuncture, a small electric current is produced. On this principle a thermo-electric battery has been produced, but what we need is a thermo-electric generator of large size where the heat produced by the burning coal will be directly converted into electricity. By this process, at least fifty per cent more energy could be derived from the same amount of coal. And this aside from the advantage of junking almost half of the equipment now needed to produce power. To say that this is a billion-dollar idea is surely leaning toward conservatism.

A flying machine that will be able to operate vertically and horizontally is a much needed idea. True, we have the helicopter, but in its present form it by no means offers a solution to the problem. It is really a makeshift and but a passing fancy of designers. It can never endure. It is simply an airplane with two propellers.

When problems of invention and research are discussed, there always appears that old but none the less interesting sub-



A method of storing electrical energy is needed, so efficient that instead of gasoline motorists can use batteries.

A boon to the farmer would be a cheap nitrogen fixer for producing fertilizer from the air.

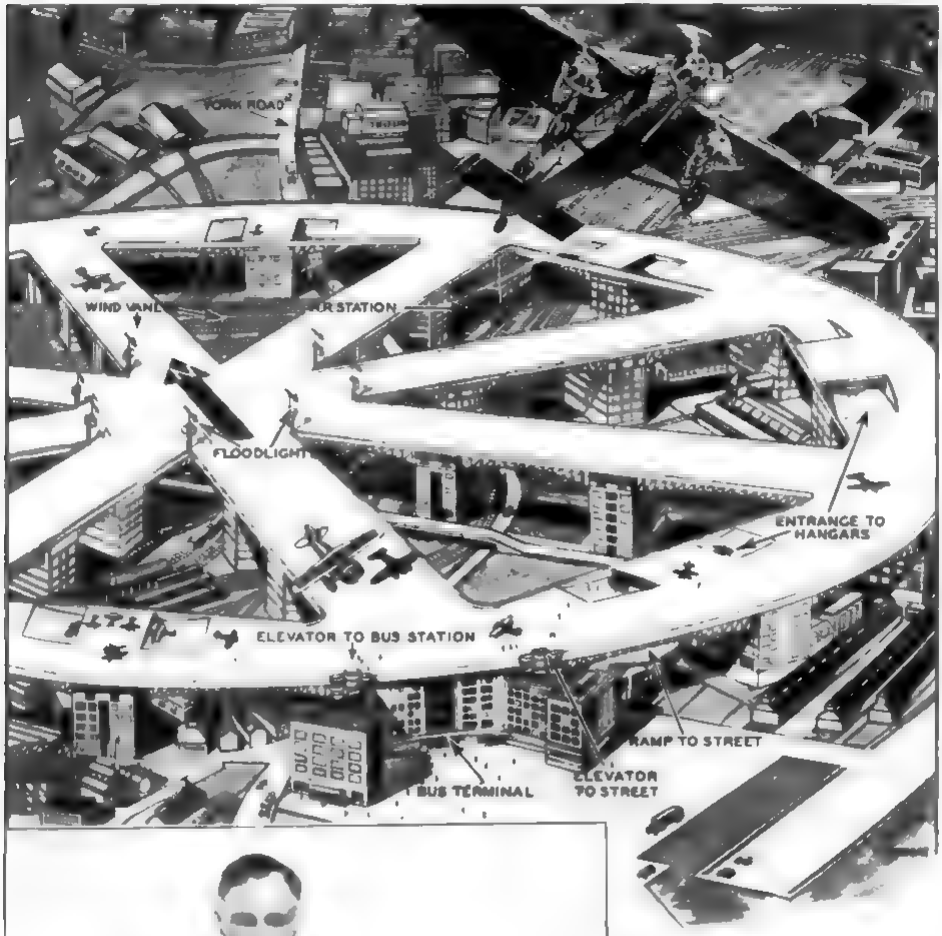
ject of light without heat. It was brought out for discussion on this particular occasion and it was decided to include it. Not only that but it was decided that we are getting dangerously close to its solution. The last year has seen the development of gas-filled lamps that offer a great deal of promise in supplying perfectly white light at very low cost. This new filamentless bulb has come as a result of researches into the conduction of electricity through gases. It is a billion-dollar idea but it has by no means been perfectly commercialized and it still awaits those final touches by some genius who is bound to receive a handsome reward for his efforts. Indeed, there is an odd race going on in this field of cold light research. Another and highly revolutionary idea is that of painting the walls of a room with a luminous paint which is first "charged" with light and which continues to glow for hours after the charge has been received.

And then we might consider the elimination of static in radio as a problem of the first order. This is especially so since the advent of television, for it is obvious that static is going to interfere more with television than it has with voice radio. Imperfections are more discernible to the sight than to the hearing. It is no secret that a number of our very large electrical manufacturers are now ready and willing to pay one million dollars in cold cash to the man who can solve this ugly problem. Its solution will mean many billion of dollars to the radio industry in the years immediately ahead of it.

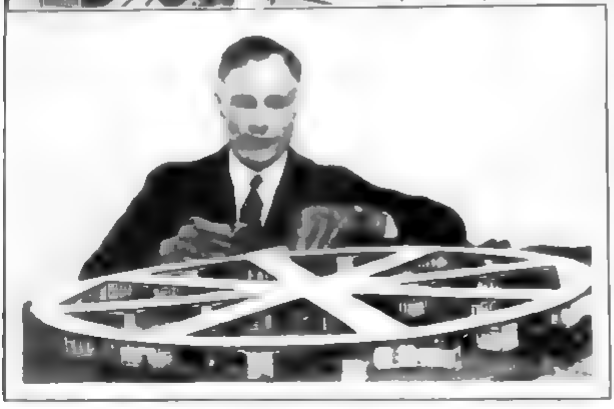
The transmutation of the elements was concerned along with atomic energy and while this would no doubt be an invention worth countless billions, it was thought to

(Continued on page 186)

London to Build Mid-City Air Port



Here is an artist's conception of completed London aerodrome, built over roofs of buildings in heart of city, making landing field easily accessible to air passengers.



Mr. Clever with his model of air port to be built over buildings.

WITH the rapid growth of airplane transportation, the air port of the future may be moved up into the center of the city where it will be easily accessible. A bold step in this direction has been taken by Charles Clever, a London architect, who has constructed a model for a proposed airport to be located in the heart of London. The landing field consists of four runways arranged in the form of a giant wheel, the entire structure being supported by the buildings over which it is erected, as illustrated.

Phonograph Records Teach Parrots to Talk in One Week

PETER JENSEN, a veteran bird trainer at the Luna Park zoo, Los Angeles, has simplified the task of teaching parrots to talk. He holds "classes" twice a day, his classes usually consisting of four or five birds seated on a perch that has a phonograph with a loud speaker at one end. His records are specially made and reproduce the usual phrases such as "pretty poll," "hello polly," etc.

When he turns the machine on the "pupils" soon become interested. After an hour of this instruction each day for six days, even the dumbest bird begins his imitations. They are then graduated to the whistling class and later to grand opera.

Peter Jensen, veteran bird trainer, teaching class of parrots with phonograph records reproducing "pretty poll," "hello polly," etc.

Glass Ventilator for Rear Window

Adjustable glass vanes, recently invented, provide car ventilation and easily keep out rain.

AN ADJUSTABLE glass ventilator that can be applied in the place of the window of an automobile in twenty minutes is the handy invention recently patented by Joe Jackson, of Memphis, Tenn.

The ventilator is completely watertight and even in a hard rain the ventilator can be left open without danger of water entering the car. The glass vanes are adjustable to any angle, and serve in addition to provide a draft through the tonneau.

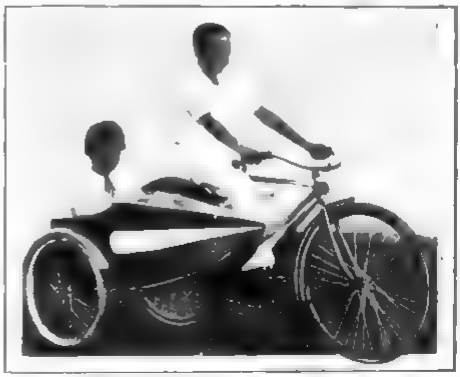
When the car is unoccupied the vanes can be locked from the inside, and when left slightly cracked no moisture will gather on the other glass enclosures of the car. The ventilator will fit any car, and can be fitted in place by owner.

Wax to Make Lubricating Oil

SYNTHETIC lubricating oil made from wax, the very constituent which chemists have so long sought to eliminate from oil, will soon come to the front as a necessity of modern machinery. Outstanding features of the new oil will be low cost and high efficiency.

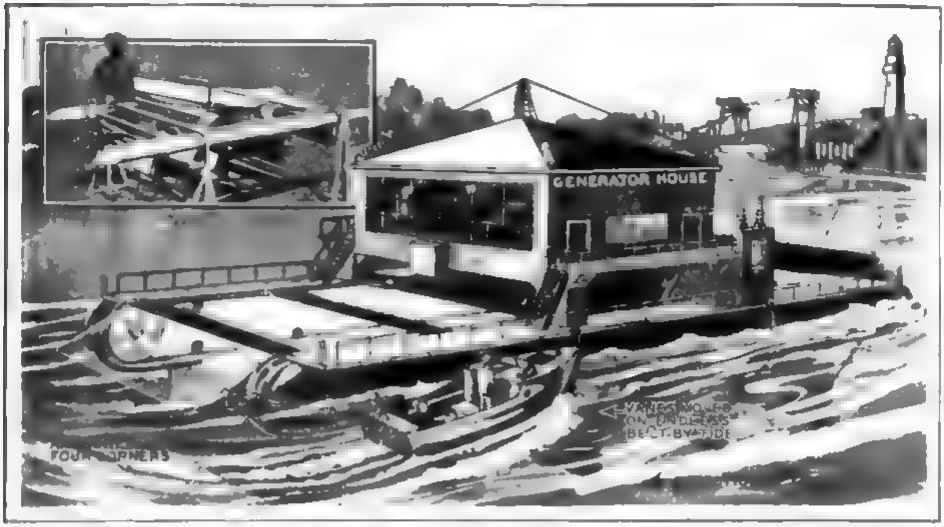
Side Car for Bike Passenger

MANUFACTURERS have recently put on the market a side car which can be attached to any make of bicycle. With rigidity, durability and lightness as its outstanding features, the car carries an extra passenger without strain on the frame work.



Light weight side car carries extra bike rider.

Tide Push on Vanes Turns Dynamos



Electricity is generated by this new tide power invention by means of a series of swinging vanes which are pushed along by current on endless chain geared to dynamo. Insert shows model of the device.

Sun Bath Helmet Prevents Sunburn

THE latest contribution to the science of improving feminine beauty is a helmet having a glass shield which is treated to remove infra-red rays from sunlight, allowing wearer to retain white skin on the face.

Glass in this helmet prevents sunburn of face.

OPENING up new possibilities in the generation of electricity by swift flowing streams, a tide power device invented recently by Peter Brevick, of Detroit, makes use of a series of swinging vanes which move with the current on an endless belt to operate a dynamo.

These vanes are so hinged to the belt that they drop to a vertical position as they move over the sprockets and strike the water. Stay chains hold them rigid when they are pushed by the onrushing current. On arriving at the end of the run they again assume a horizontal position as illustrated above. The vanes can also be retarded or advanced as the tide changes.

Advantages of this invention are many. The units can be any size; any slow moving current can be utilized; installation is extremely cheap.

Why Paper Money Has Long Life

PERHAPS you have often wondered why paper currency never gets torn or frayed. Well, here's the reason. At the Government Bureau of Engraving, where the paper is made, animal glue is used to size and re-size the money. The sheets are passed through a bath containing approximately 4 per cent glue and alum.

Glider Flies Round-Trip Over Channel

Herr Kronfield arriving in his glider at Dover at the finish of the first stage of his historic round trip crossing of the English Channel. He completed the double crossing in four hours, winning $5000.

New Flashlight Has Wide Beam

New "pen-light" gives 180-degree angle light.

PERSONS who find it necessary to carry small light weight flashlights with them will find what they need in a small pen light shaped like a fountain pen which is now being marketed. Extremely durable, the pen light throws a 180-degree beam, being switched on with a push button in the tip, as shown at the left. Note wide diffusion of light. Clip permits pocket wear.

Fish Gills on Man Prove Evolution

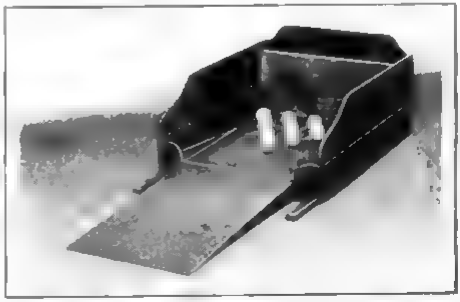
A MAN with gill slits on his neck like a fish has been discovered in Germany and was examined recently by physicians and biologists at the University Clinic at Heidelberg. No "pre-natal influence" or other mystery is involved, the scientists agreed, but merely a "throw-back" to the condition of mankind's fish-like and frog-like ancestors millions of years ago in evolution. A few human beings have been born with ape tails.

THE first double crossing of the English Channel in history was accomplished recently by Herr Kronfield, German gliding expert, when he flew in his motorless plane from Brussels, Belgium, to Harnsworth, England, and back again.

Starting the astounding flight in the tow of a plane piloted by his friend, Herr Weingert, Herr Kronfield completed the historic round trip in the brief span of four hours. The feat was not without its rewards, for Herr Kronfield collected a wager of $5,000 when he set his ship down at the end of the trip.

Golf Now Played Like Ten Pins

LATEST innovation for golfers is a combination golf and bowling game in which the player attempts to dislodge a number of balls arranged like ten pins. Players score by dislodging balls with golf stroke.



In this new game, combining golf and ten pins, player dislodges "pins" with golf ball to score.

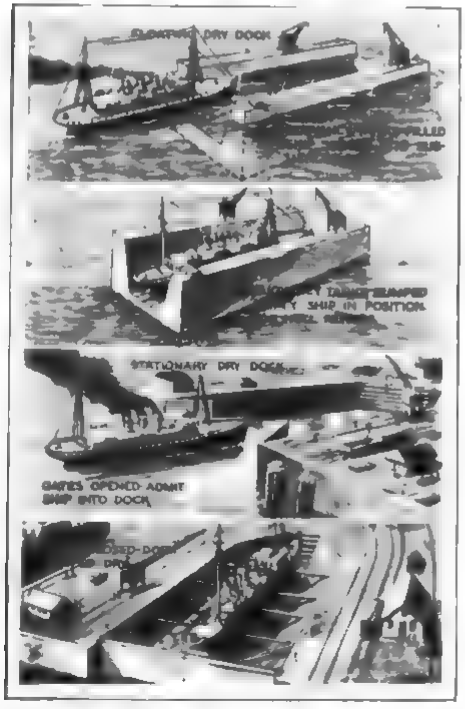
Mechanical Doctors

"S. S. Cristobal" undergoing repairs in dry dock. Barnacles are scraped from hull, which is then painted to boost vessel's speed.

by

JOHN CRANE

Clipping seconds from trans-Atlantic passages of ocean greyhounds and guarding against disaster at sea is mainly a matter of keeping these great vessels in perfect trim. This stupendous task is entrusted to "Mechanical Doctors" who in some cases virtually rebuild the ships. Most outstanding of these costly feats of mechanical surgery are described here.



Above drawings show operation of stationary and floating dry docks, in which big liners are overhauled. Note methods of emptying the slip.

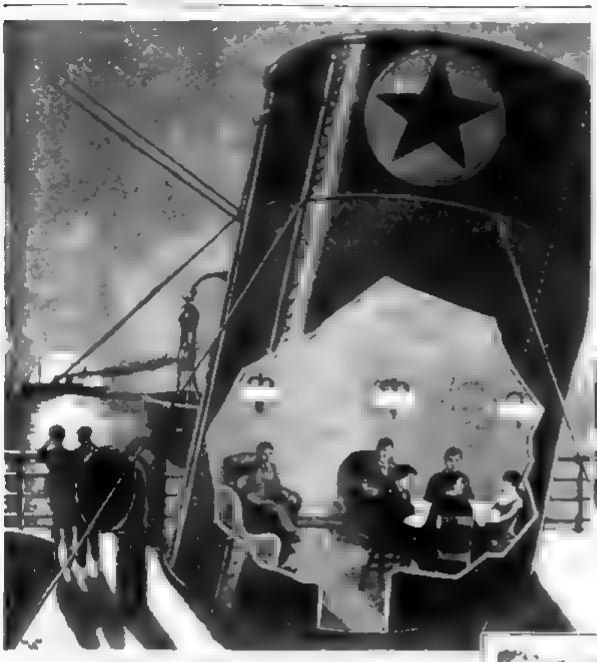
SPEAKING of operations, when mechanical surgeons recently gave the *Leviathan*, flagship of the United States Lines, a thorough thumping, rejuvenating her entire system, the bill came to $600,000. Every big steamship line in the world must foot a big mechanical medical bill each year in order to keep its liners in topnotch condition. Not long ago the Cunard Line spent $2,000,000 to give five of its vessels a general overhauling.

For that $600,000 fee the *Leviathan* underwent two major operations in drydock. It was discovered that she had a 20-foot perpendicular crack in her plates, forward of amidships on the starboard size, which needed attention. Also it was found that the forward expansion joint, which takes up the shock of the waves, had become, technically speaking, "unstuck".

Over 6,000 huge rivets were hydraulically inserted in the 76 new plates which replaced the cracked ones. This work was done by the United Dry Docks, Inc. Workmen stripped the staterooms on four decks so that the engineers were able to get to the damaged plates. The *Leviathan* was laid up for two months on that occasion.

During that period of convalescence, 500 men were employed to scrape the hull of

KEEP SHIPS *in* TRIM



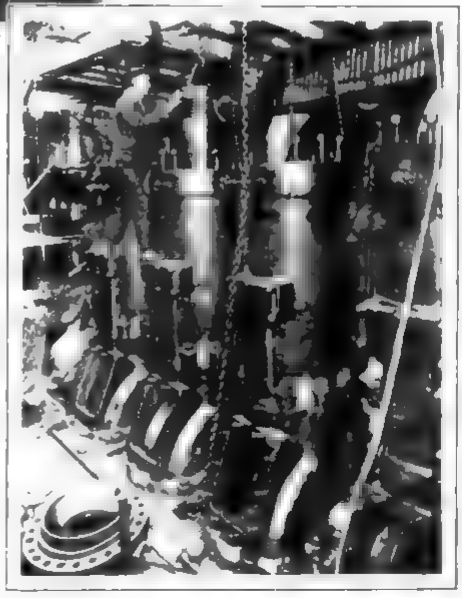
Huge funnels have been rendered useless with passage of steam and increasing use of Diesel and Turbo-electric motors. Funnels are retained for appearance sake, used as card- or storerooms.

Here "Mechanical Doctors" are removing giant funnel from liner "Bremen" for replacement by a taller stack.

the ship and paint it. Her interior was also re-decorated. This added $70,000 to the doctor bill.

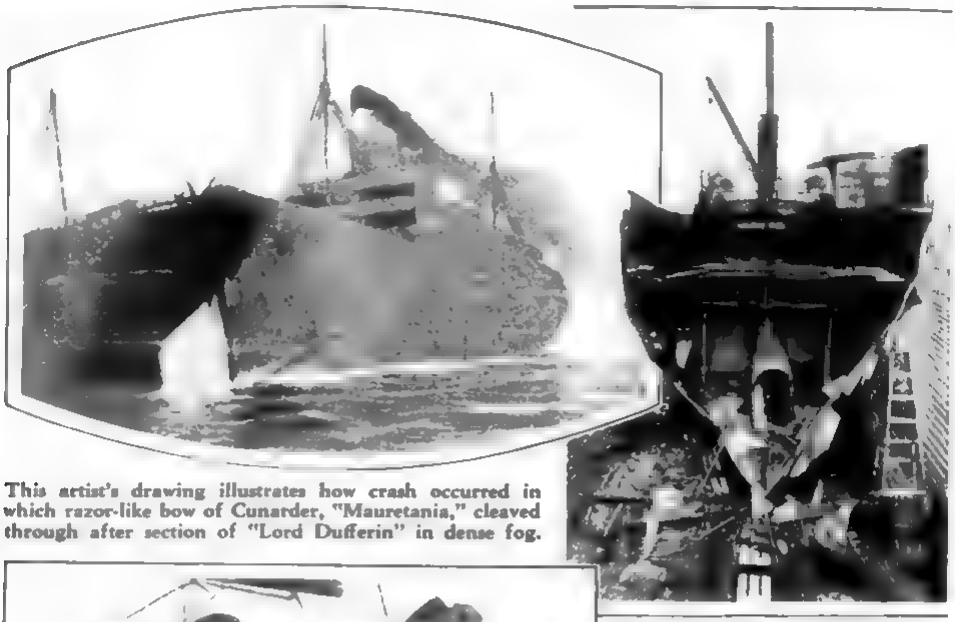
At least twice a year every big ocean liner goes through a thorough examination at the hands of the engineers and mechanics in drydock. Ships which cost all the way from $10,000,000 to $30,000,000 to construct cannot be neglected, or allowed to deteriorate the slightest bit. As soon as they show any symptoms of trouble, the skipper reports it to headquarters and the boat is sent in for repairs.

The task of the mechanical doctor does not end with keeping the liner in trim. It is also his job to keep pace with improvements in ocean-travel, such as developments of new engines or other accessories. He knows that funnels have now come to signify only something swanky and showy on a big

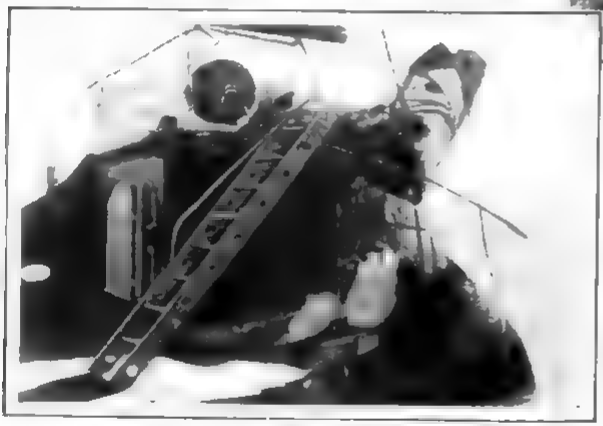


Performing a minor operation on the "innards" of an ocean greyhound—workmen installing new pistons in Diesel motors of "S. S. Sierra Cordoba."

After Section of "Lord Dufferin" Completely Rebuilt After Crash in Fog



This artist's drawing illustrates how crash occurred in which razor-like bow of Cunarder, "Mauretania," cleaved through after section of "Lord Dufferin" in dense fog.



The after section of the "Lord Dufferin" after the crash. Struck just aft of hatch No. 5, her entire stern was almost completely shorn off. She was raised by pontoons and towed into graving dock, where complete new after section was built on.

The first act of the repair drama—the "Lord Dufferin" in dry dock ready to undergo restoration of stern. Note that propeller, tailshaft, shaft alley rudder and even the poop deck have been lost in a smash while at sea.

sea giant. Often the funnel, if one would venture to investigate, turns out to be a dummy, used simply as a storeroom or card-room.

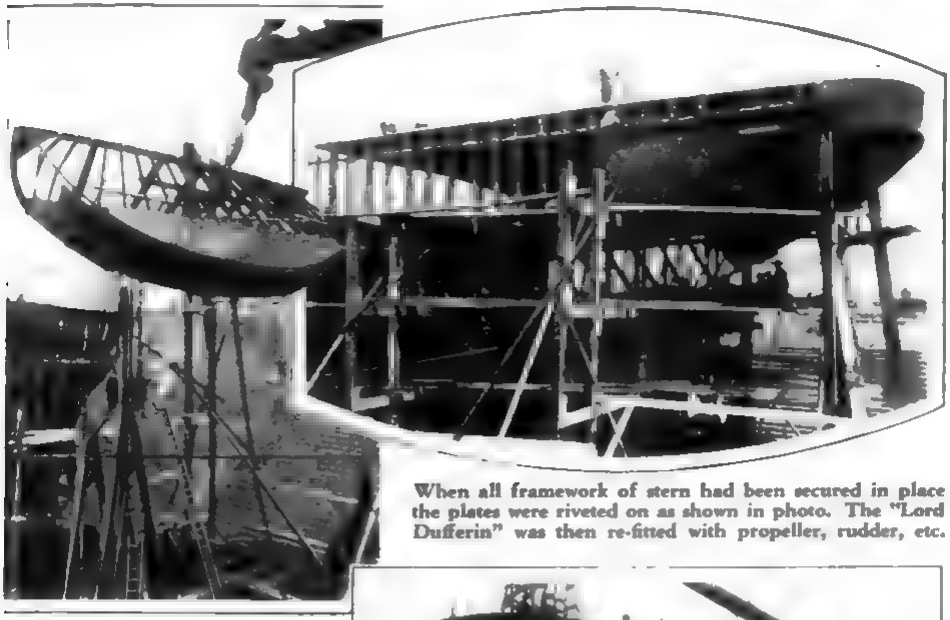
It is a popular fallacy that ships with three or four funnels are faster and sturdier than those with one or even two funnels. But it is becoming generally known that steam is passing from the sea, and that even the turbine is being pushed into oblivion by the internal combustion engine, though turbine-electric engines are found on the Dollar Steamship Line boats recently launched.

In reality, however, funnels are problems on the new motor ships. They do not need anything more than a pipe to carry away the fumes. On the other hand, the ship architects feel they would look bare and unappealing without funnels of some kind. So they now use two funnels which are squat but very fat on the new types of ocean greyhounds.

In the cases of the *Bremen* and the *Europa*, crack liners of the North German Lloyd company, and both of which lowered the record of the Cunarder, the *Mauretania*, it was found that the funnels were too low. The *Europa* which holds the record for crossing the Atlantic in 4 days and 17 hours, had to go into drydock eight months after she was launched last year to have her stacks lengthened. She was also scraped, repainted and equipped with new propeller blades. That one operation cost nearly a quarter million dollars.

Sticking to the human analogy of ships, the mechanical doctors do not only have to

Stern Frame of "Dufferin" Built on Shore, and Then Riveted on Vessel



When all framework of stern had been secured in place the plates were riveted on as shown in photo. The "Lord Dufferin" was then re-fitted with propeller, rudder, etc.

In restoring after section, entire stern overhang was fabricated, assembled, and riveted together on shore and then hoisted in place. All parts were assembled in this manner to speed up the job of getting the ship to sea.

This photo shows the "Lord Dufferin" with complete new after section, ready to take to the water again. As good as new after being literally restored to life, she sails the seas in perfect trim.

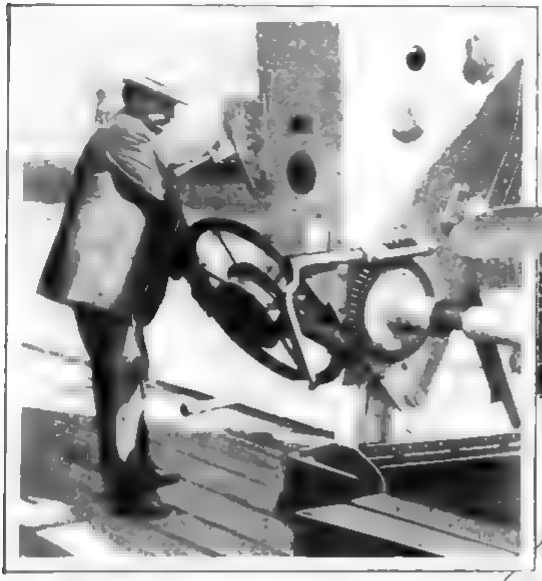
provide for the wear and tear of a liner in the course of ordinary voyages, but they are called upon in great emergencies, just as a regular surgeon might be called upon to perform some vital operation after some accident or other catastrophe.

One of the outstanding ship surgical feats in this class is that of the renewal of the after section of the British freighter *Lord Dufferin* not long ago. The officials of the Todd Shipyards Corporation refer to this job as the most interesting bit of repair work ever handled by any ship mechanics.

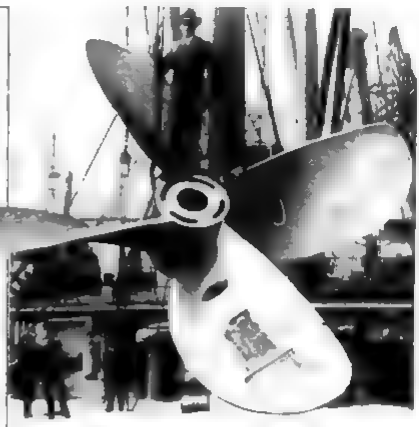
The razor-like stem of the *Aquitania* had cut the freighter completely in two at a point about twelve feet forward of the poop deck and just aft of cargo hatch No. 5. The section to be restored measured 64 feet, and a small scale outline, a deck plan and a photograph were the only guides available.

This job was completed in the record time of eighteen and one-half working days and when the *Lord Dufferin* left the Robins Dry-dock at Erie Basin, Brooklyn, the new section had been so skillfully built on that the water lines and sheer lines vanished into the original portion of the hull so perfectly that it was impossible to detect that 20 per cent of the hull had been rebuilt.

Penetrating deeper into this eminent piece of ship surgery, I learned that after the *Aquitania* had smacked the *Lord Dufferin*, the freighter had to be raised by pontoons, towed to the Erie Basin yards and placed in the graving dock. The after-portion of the vessel, including rudder, stern frame, propeller, tail shaft, stern tube, two lengths



All equipment of liners is inspected periodically to guard against disaster at sea. Here an inspector is testing life boat davits, which are repaired immediately if found out of order.



Here is the last word in propellers, which is to be installed on Canadian liner to boost speed. Holes in blades, leading to hub, relieve air pressure, eliminate vibration.

of intermediate shaft and machinery and fittings in the section, had been lost.

Three moulds were taken of the sound portion of the hull at equal distances just forward of the cut. Lines were then run for the new stern and faired up to the satisfaction of owner and surveyors. Moulds were also made of all frames, beams, floors, keelsons, stringers, tanks, tunnel recess, bulkheads and deck-plating.

The entire stern overhang, from and including the transom frame aft, was fabricated, assembled and riveted together on shore and after being hoisted in place was secured on stays. While this work of reconstruction was underway, the propeller, tail-shaft, stern tube, intermediate shaft, bearings, rudder, fittings, winches and accommodations were rushed to completion so that there would be no delay in their installation as soon as the work on the hull had advanced far enough to receive them.

Following the erection of frames, floors, beams and stringers, templates were made of the shell plating, the material was then fabricated, hung on the ship and finally riveted. She was then dismissed from the drydock and today she proudly sails the high seas in perfect trim.

Facing keen competition, ship owners must adopt all latest improvements. Above photo shows new boilers being hoisted aboard "S. S. Deutschland" to be used with modern engines which were installed to increase ship's speed across Atlantic.

Most of the ocean liners go into drydock during the off-season on their particular route. The trans-Atlantic vessels get their thorough once-over during the winter while the ships which ply to southern waters get their overhauling in the warmer months.

(Continued on page 208)

Jeweled Auto, World's Costliest, Owned by Persian Shah

Above photo shows bejeweled and silver plated dash board instruments on automobile owned by great Shah of Persia and valued at $125,000.

THE world's most expensive car is valued at $125,000 and is owned by the great Shah of Persia. Finished in silver and upholstered in blue leather, this costly machine has hub caps, instrument panel and shift lever knob inlaid with diamonds and other precious stones, making the car the world's greatest motor investment.

When the car is placed on display it is constantly guarded by a detail of picked soldiers and detectives, and with good reason, for the car proves a great temptation to clever thieves. A strong guard of mounted police also accompany the Shah whenever he takes a ride in his car to guard against the bandits which infest the highways.

Train Flyers to Live in Vacuum

THE importance of training human beings to live and breathe in a vacuum so that flying in the higher levels of the atmosphere may be possible was emphasized at a recent session of the Academy of Sciences, in Paris, by the distinguished engineer, M. Georges Claude.

That human beings could live without breathing oxygen nobody imagines, but it might be possible, M. Claude believes, to provide this necessary oxygen in the form of a very small stream of the pure gas supplied by a tube held in the mouth or nose, allowing the general surface of the body to be exposed to the vacuum. The practical problem, M. Claude urged, is to discover just what degree of vacuum the human body can stand without blowing up from internal forces.

Metal Tie Form Saves Knotting

Tie is knotted around form, held in collar with band.

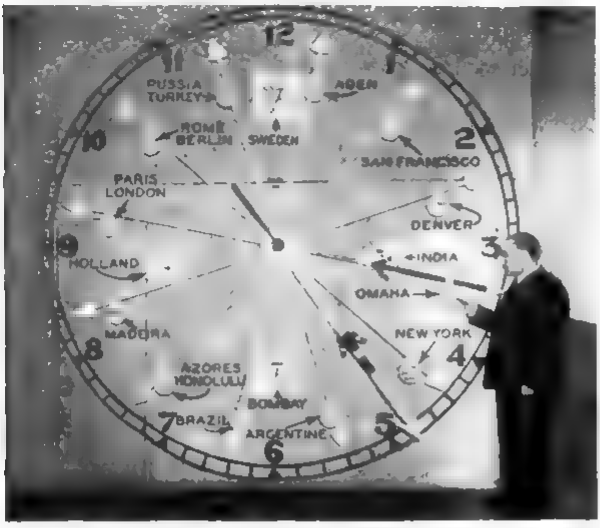
FOUR in hand ties need be tied only once with a new non-rusting metal form now being marketed. The tie is knotted about the form as illustrated at the left, and an attached elastic makes it possible to attach and remove the tie from the collar quickly. Any tie may be used.

Chemical Gun Kills Dandelions

This "gun" kills dandelions by injecting death-dealing chemical into roots with plunge of handle.

WITH a new chemical gun recently patented it is only necessary to stroll over your lawn and place the device over the dandelions to be killed. A slight pressure on the handle of the gun releases sufficient chemicals to do the job. Within a day or two the weed will crumble away, with its roots permanently killed.

Giant Home-Made Clock Tells Time of All World Nations



This huge clock shows at a glance the time in 27 nations of world.

USING parts salvaged from other clocks for its construction, Sam Cosentino, an Omaha watchmaker, has built a huge clock that shows on its face the time in 27 different points of the world at a glance. There are 12 hour hands and one minute hand on the 11-foot dial; and there are four small dials which show the time in Sweden, India, Bombay and Holland, where the minutes vary as well as the hours. The hour hands are five and one-half feet long.

The clock is operated by the works of a clock formerly on the Omaha Union Station. The mechanism is hooked up with a 60-inch dial in the store window, and runs by a 75-pound pendulum and a spring operated by a cable to which 100-pound weights are attached.

How to Cure Slipping Fan Belt

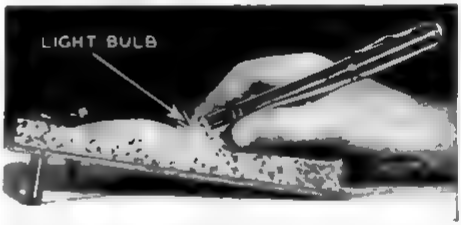
IT IS sometimes possible to cure slipping auto fan belts by removing the belt and winding two or three layers of friction tape on the pulley. This is only for flat belts.

Periscope Looks Above Race Crowd

Viewing race through handy, light weight periscope.

VIEWING horse races through periscopes is the means devised by English racing enthusiasts to overcome the disadvantage of milling crowds at the race tracks. The periscopes are extremely light, and are equipped with an eye piece and inner barrel which is sufficiently large to give a clear, comprehensive view of the tracks. The photo shows the device in use.

Light on Pencil for Night Writing



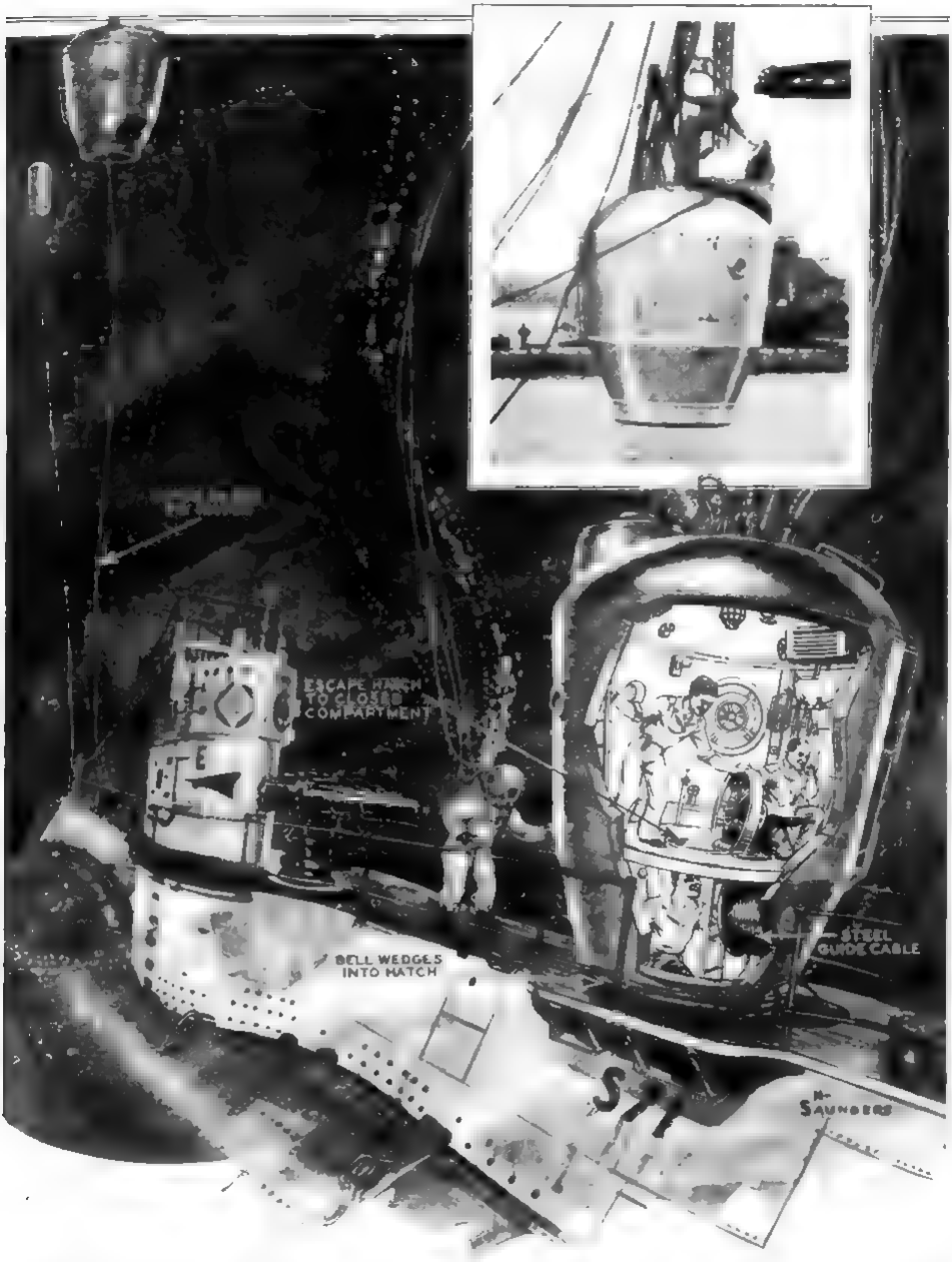
Combination flashlight and pencil shown in the photo above permits writing in dark with ease.

A NEW combination flashlight and pencil now being marketed enables you to write at night as easily as in daylight. A flashlight bulb is fitted next to the lead and is turned on by twisting the screw.

Genius Brains Willed to Scientists

AUSTRIANS of unusual ability are being urged to leave their brains to the newly organized Brain Institute of Vienna, so that these organs may be studied scientifically, as the brain of Lenin has been studied. Numerous scientific men of Vienna, including the famous physiologist and medical expert, Professor Wagner-Jauregg, have inserted clauses in their wills leaving brains to the institute.

Diving Chamber Rescues SUB CREWS



This artist's drawing depicts rescue of crippled sub by new submarine life saving chamber recently perfected by U. S. Navy. Constructed of steel, the device has two compartments, upper, which houses rescue crew, and lower, which receives sailors from hatch of sub. In making rescue a diver first fastens cable to sub hatch, then chamber is hauled down with winch. Water is blown from lower compartment through which sailors escape. Insert shows bell suspended from derrick ready for test dive.

Cast-off Shoes Make Tires for "Rough Rider" Bicycle

Discarded shoes fitted on wooden spokes form wheel rims of this bike, made by Marie Glory.

IF YOU don't know what to do with your old shoes, here's a suggestion—make bike wheels out of them. No less a unique stunt has been performed by Marie Glory, a well-known Parisian bicycling enthusiast, as the photo at left shows. The regular wheel has been dispensed with altogether, and the "shoe wheel" substituted.

Each shoe is fitted over a form, which is in turn attached to the ends of a spoke, of which there are six on each wheel. Although these bike wheels are the last word in novelty, it cannot be said that they are the last word in comfortable riding. The inventor, however, enjoys the sport.

Golf Tee That Can't Get Lost

A HANDY and "loss-proof" tee for golf fans may be made from a half-inch length of rubber hose and a two foot length of stout cord. In the side of the hose punch a small hole to take the cord, the end of which should be knotted. Attach other end to the golf bag to avoid loss.

Wherever you go with your golf bag, the tee goes also, carried by the cord.

Attach tee, made from half inch of rubber hose, to the golf bag with stout cord as shown above.

Insects Tell Quality of Tobacco

AN insect known as the tobacco beetle agrees with human smokers about which tobaccos are best. This beetle which lives on stored tobacco leaves is able to tell good tobacco from bad as skilfully as the best tobacco expert. Testing the beetle's taste for different kinds of tobacco it was found that the beetle preferred good tobacco to bad, as judged by the taste of human smokers. With tobaccos of the same kind but with different amounts of aging, the beetles preferred the older stock, like all human beings.

Styptic Pencil in Shaving Brush

THE ordinary styptic pencil for treating accidental razor cuts has a way of hiding itself at critical moments. This annoyance can now be avoided by the use of a recently patented shaving brush which carries a styptic pencil fitted into the handle of the brush. The pencil can be readily unscrewed when needed, and the user is assured that it has been kept in a very sanitary condition in the handle of the brush.

Fitted into shaving brush handle as shown, styptic pencil always is handy.

Beacon BEAM TELLS Hours of Night

This "nocturnal sun-dial" of Guayaquil, Ecuador, tells time by revolving beam projected on landmarks.

A GIGANTIC nocturnal sun-dial, using light instead of shadow to tell the time, is to be installed by the municipality of Guayaquil, Republic of Ecuador. The light source will be an electric searchlight which, revolving once every 12 hours, will indicate the time by illuminating surrounding landmarks at the same time each night.

Guayaquil is at present constructing beautiful gardens along the waterfront of the port. In the center of these gardens, a Moorish tower is being erected to hold an old historic clock dating back to 1841. A large airport beacon will be mounted on top of this tower and will make one complete revolution every twelve hours.

The beacon, a 24-inch unit with a 1,000-watt lamp, will be operated by impulses from a telecron electric clock, the current being transmitted to a solenoid-operated turning mechanism every five seconds through the medium of a standard traffic timer. Thus the beacon, as it turns, will indicate the time by illuminating various landmarks at the same time each night.

The powerful light directing the beams toward the landmarks will be automatically thrown into operation at sunset and turned off at sunrise, being out of service during daylight hours.

Portable Radios for U. S. Cavalry

THE latest in portable radio receivers and transmitters has been developed by Signal Corps engineers for use by the U. S. Cavalry. The antenna is strung on a short mast, while the instruments are carried on the saddle, as illustrated below.

A U. S. cavalryman equipped with the portable radio developed recently in the Signal Corps.

Yacht on Wheels Speeds 95 per on Land, Balks on Water

The non-floating auto yacht built by "skipper" G. J. Schwenk.

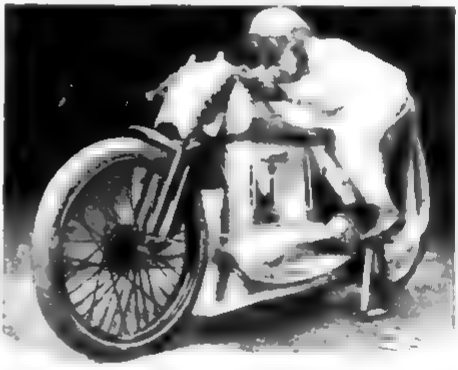
A LUXURIOUS yacht on wheels but one that won't float in water attracted much attention at the Indianapolis Motor Speedway during the 1931 Memorial Day gasoline derby. Built on a Pierce-Arrow chassis, the "boat" is 24 feet long, 5½ feet wide, weighs 5,700 pounds, is powered with a 132-horsepower motor, and cost $18,000. The vehicle is a boat in every respect save locomotion. It has no doors, has twin screws in the stern, fog horns and an engine room bell, radio and life savers hanging on each side.

Oiled Balloons Limber up 'Gators

TRAINERS at the Los Angeles alligator farm have originated a new and unique method for exercising their century old saurian charges. A few balloons liberally smeared with fish oil and then floated over the pool do the trick. Catching the scent, the "gators" come a-runnin' and it's surprising the way the sleepy old creatures stand up on their hind legs to snap at what looks to them like a very colorful morsel of eats. Exerting themselves in this manner they limber up and get some of the mud out of their veins. In addition, the stunt provides visitors to the zoo with some keen amusement. Photo shows 'gators lunging at balloons.

'Gators at Los Angeles farm get exercise by snapping at deceptive balloons smeared with fish oil.

Streamlining Boosts Bike Record



Arthur Simcock, daredevil racer, trying out streamlined motorbike on which he set unofficial record of 160 m.p.h. 200 m.p.h. was attempted.

RIDING a motorbike embodying the last word in streamlining, Arthur Simcock, daredevil motorcycle rider of Great Britain, attempted to smash all speed records for this type of vehicle, aiming at a mark of 200 miles per hour.

His motorbike, shown in the photo above, was specially constructed for the whirlwind run, which was staged in Budapest, Hungary. Although he failed to attain the 200 mile mark, he did manage to break the previously established record of 150 miles per hour by hitting up a clip of 160 m.p.h. Owing to engine trouble, which prevented a return trip, the speed was not counted as official.

"Human Quoits" Is Amusing New Bathing Beach Game

Ringing human heads with padded hoops is the latest society beach fad, known as "human quoits."

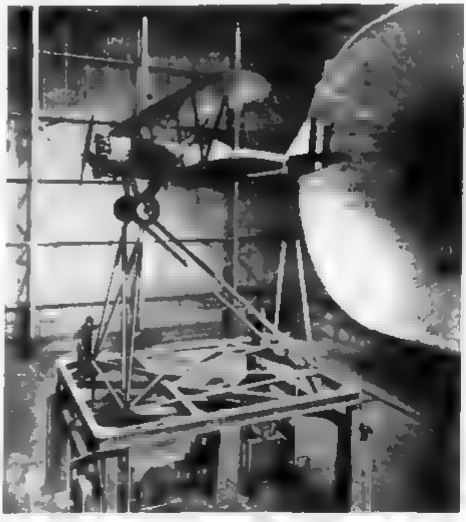
YOU have to use your head in this amusing new game of "human quoits" in which padded barrel hoops are tossed at the heads of players buried in the sand, the object being to "ring" them. It's a game amusing to spectators as well as players, and one in which the human targets get quite a thrill, since, buried in sand as they are, dodging is impossible. If you want to try out this game on your own beach, light weight hoops can be made by winding cotton batting and a covering fabric around a core of light gauge steel wire.

Ants as Household Pets

ANT houses for children to build and watch at school and at home, as many schools and homes now keep bowls of goldfish or other kinds of aquaria, have been introduced at Hanover, New Hampshire, by Prof. Frank E. Austin of Dartmouth College. An ant house consists of two sheets of glass held in a wooden frame, like the two panes of a double window. The space between the glass sheets is filled with layers of sand or soil like that in which the ants ordinarily live. An ant colony is started in this glass house by introducing either a part of an existing colony or a fertilized ant queen who can start a new one. The ants proceed to build typical underground tunnels and chambers in which the life of the insects goes on just as in a normal ant-hill, apparently indifferent to the exposure of insect secrets to human gaze.

Tunnel Tests Full-Size Planes

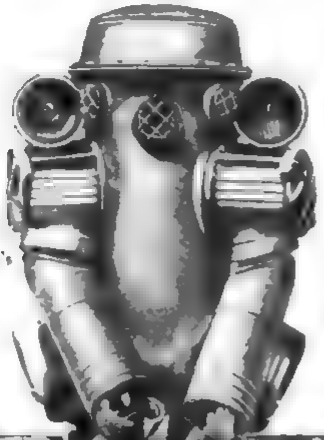
FULL-SIZE airplanes can be tested at a speed of 115 miles an hour in a jet of air 60 feet wide by 30 feet high flowing through the largest wind tunnel in the world, just completed for the National Advisory Council for Aeronautics at Langley Field, Va. Previously wind tunnel tests of airplanes have been limited to comparatively small scale models.



Immense size of the wind tunnel can be judged by comparing it with the man standing inside it.

MILLIONS in GOLD

by DONALD GRAY



Bowdoin's diving suit.

STORIES of buried treasure, hidden by Lafitte or Kidd or concealed somewhere about the old homestead by the wealthy farmer who was afraid of banks, usually have this one feature in common: although the existence of the treasure is well-authenticated and widely credited, nobody knows exactly where the hidden doubloons have been laid to rest.

But in the case of the treasures dealt with in this particular story, no such depressing uncertainty as to their locations exists. You may have these treasures for the trouble of taking them—$125,000,000 worth—and

This submarine tractor-shovel combines features of several treasure recovering devices now being made.

FREE for the TAKING!

The author of this article tells you exactly where you can find $125,000,000 in gold—and it's all yours the moment you lay hands on it. The difficulty is that the gold is buried in the hulks of wrecked ships several hundred feet beneath the sea. Inventors of diving contrivances are staging a frantic race to see who will be first to retrieve the golden fortunes.

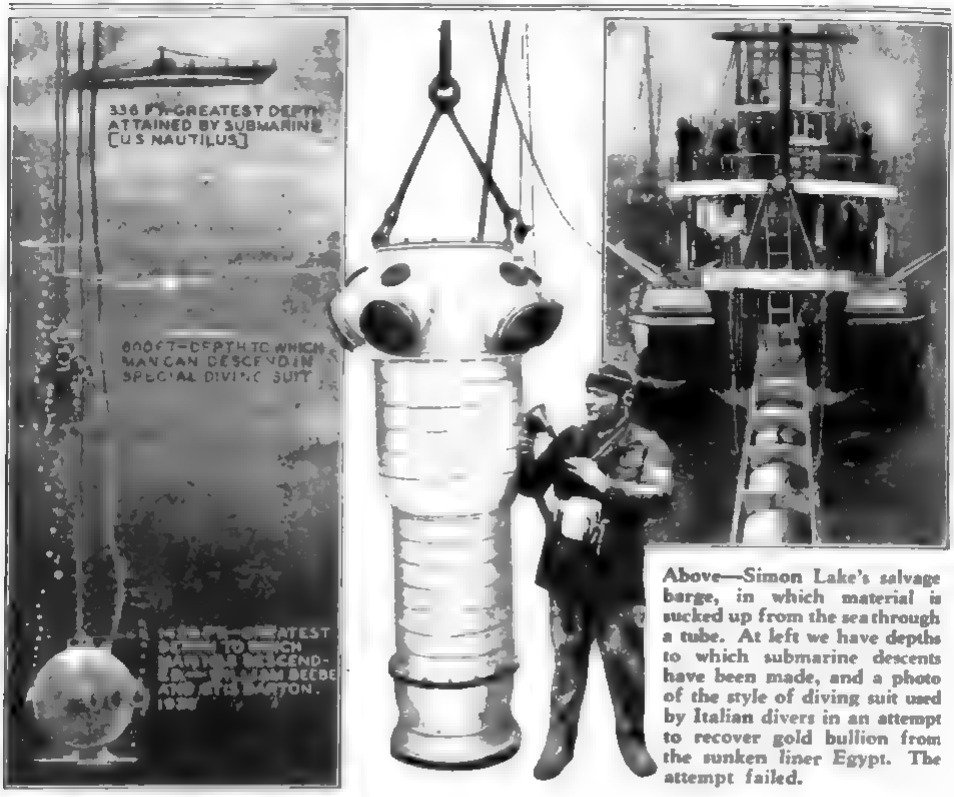
scores of men can tell you with a surveyor's accuracy just where to find them.

The difficulty is that these treasures lie at varying depths beneath the surface of the sea, carried down in all sorts of sunken vessels. Water pressures and submarine difficulties have, until recently, protected this buried gold as effectively as if it were locked in steel vaults. But now, with the development of remarkable new types of diving apparatus, these long-lost treasures seem destined to be recovered.

Mechanical ingenuity, as expressed in the perfection of a number of unique types of diving suits and elaborate salvage equipment such as the submarine tractor-shovel shown on this month's cover of MODERN MECHANICS AND INVENTIONS, is tackling the sunken treasure problem with a vengeance. If you can devise diving equipment which will enable you to tear apart sunken ships, your chance of walking off with enough gold to float a government loan is as good as the next man's, since the rule of "finders keepers" applies to the first man who succeeds.

There's nothing fantastic about the device illustrated on our cover, bizarre as it is in appearance. Photos of a submarine tractor, actually constructed and ready for use, are shown elsewhere in this article, and the steam-shovel arm is a modification of an

Gold stars on the map indicate resting places of $125,000,000 worth of sunken treasure, lying in water shallow enough to make recovery possible. Soon divers will retrieve these treasures.



Above—Simon Lake's salvage barge, in which material is sucked up from the sea through a tube. At left we have depths to which submarine descents have been made, and a photo of the style of diving suit used by Italian divers in an attempt to recover gold bullion from the sunken liner Egypt. The attempt failed.

idea now being worked out by Andrew Raiche of Boston, who expects to descend to depths of 1000 feet. The claw-like pincers of the tractor are operated by compressed air, furnished through a supply pipe leading from the mother ship above. The diving bell itself is hermetically sealed against the tremendous water pressures, and its purity of air maintained by supplies of canned oxygen and soda lime to absorb impurities. This is the system of ventilation employed by William Beebe and Otis Barton when they descended to a depth of 1426 feet in their "bathysphere," or diving bell. Their purposes, however, were purely scientific and had no connection with treasure recovery, beyond pointing out the practicability of diving much farther than had been supposed possible.

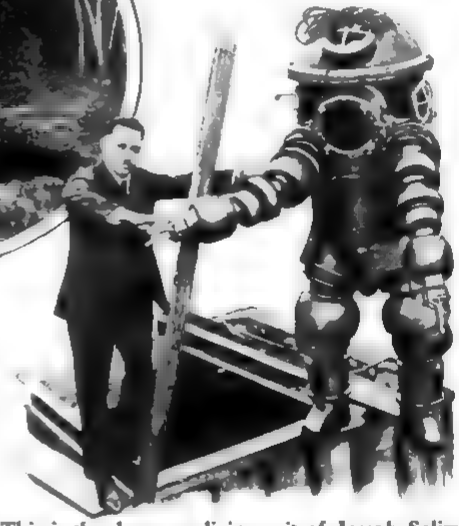
A diving suit which its inventor, Harry L. Bowdoin of New York, calls an underwater robot, and which he claims is the first practicable all-metal diving suit ever designed, is about ready to undergo its first tests in the recovery of some $4,000,000 from the sunken ship Merida, which went down in 1911 off the Virginia capes in 300 feet of water, carrying gold, silver, and crown jewels of Mexican notables fleeing their country on account of revolutions. Mr. Bowdoin claims his suit can carry a man down 600 feet without danger, and the water-tight joints in arms and legs work freely at this extreme depth, contrary to many other diving suits of the type whose joints "freeze" under water pressure.

A ship has been chartered for salvage operations by Mr. Bowdoin, and a corporation for the purpose of recovering sunken treasure is in process of financing. In common with practically all deep-sea diving suits, the underwater robot is equipped with powerful lamps to enable the operator to see what he is doing hundreds of feet beneath the surface.

Organizing a submarine treasure hunt isn't so easy as it seems, even with plenty of equipment. Take the case of the *Artiglio*,

The thrilling moment when the "Egypt's" safe was opened.

A small safe from the cabin of the sunken Egypt being hoisted aboard ship from the bottom of the sea. At right — Panama has its buried treasure too. This excavation yielded many gold and silver pieces to Lieut. George Williams.



This is the deep sea diving suit of Joseph Salim Peress, who will attempt to recover sunken treasure off the coast of Greece. He will descend 600 ft.

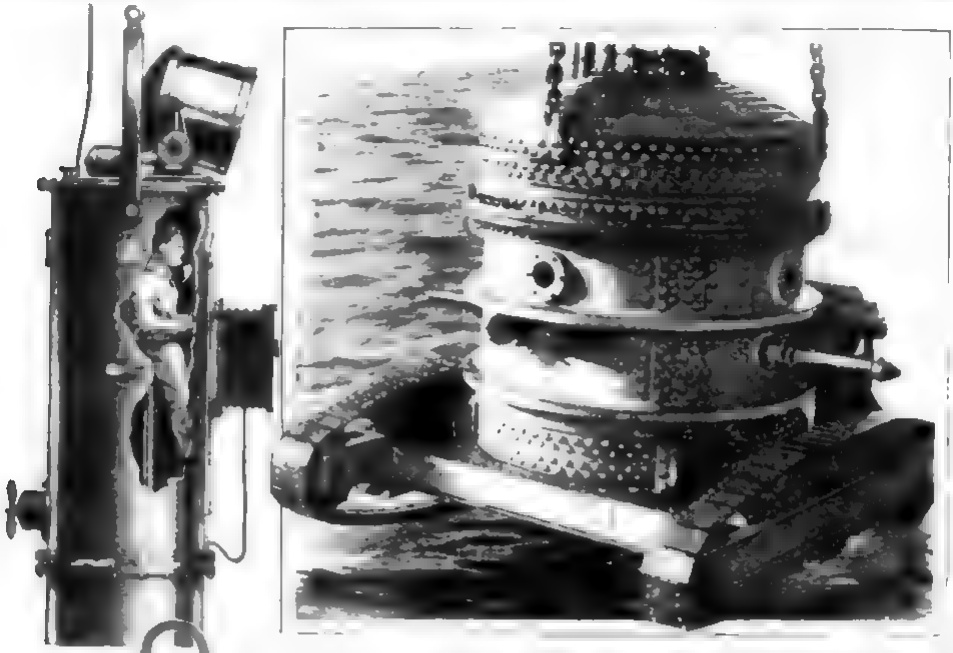
the Italian ship which was outfitted to recover the $5,000,000 in gold which the liner Egypt carried to the bottom off the French coast. After locating the wreck, and actually recovering a safe from the captain's cabin, the *Artiglio* was destroyed in an explosion when some of the powder carried on board was touched off accidentally. However, a sister ship is being fitted out to carry on the salvage work.

What are some of the big treasures worth going after? Well, there's the *Hussar*, a British pay ship which sank during colonial days. Simon Lake, who has recovered thousands of dollars worth of sunken valuables, is laying plans to salvage this gold. He identified the wreck from an anchor recovered by divers in Hell Gate, that treacherous channel in Long Island Sound.

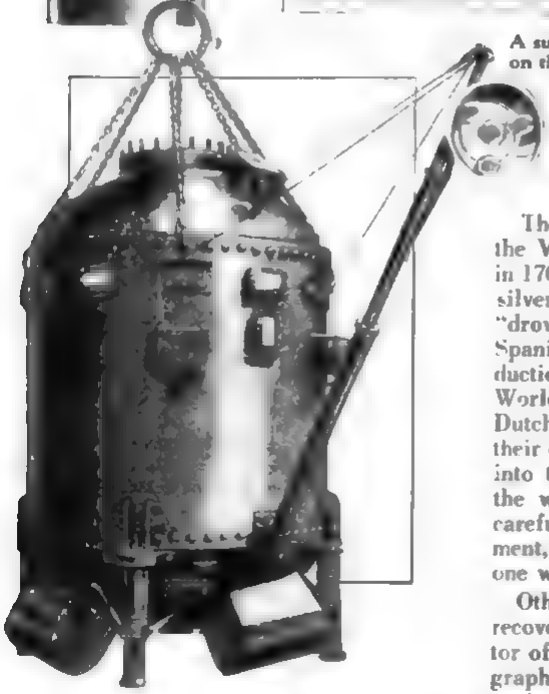
Then there is the *Principe Asturias*, which ran on the rocks off Brazil in 1915, carrying $5,000,000 in gold. A company is being organized by a group of business men to recover this treasure. From Vienna comes word that a syndicate of engineers is planning to raise two ships from the bottom of the Danube, sunk in a battle with Turks in 1526, carrying much gold-plate.

The steamer *Islander*, which sank in Stevens Passage, Alaska, in 1901, with $3,400,000 in gold dust, is being tackled by Curtis Brothers, Portland and Seattle house movers, this summer. Charles Haskell of San Francisco is going after the gold-laden *Rio de Janeiro*, which went down off the Golden Gate in San Francisco Bay in 1901,

Submarine Tractor Crawls Along the Sea Bottom, as Illustrated on Cover



A submarine tractor, similar to the one depicted on this month's cover of Modern Mechanics and Inventions has already been built for treasure recovery, as shown above. Note the sturdy steel construction to resist tremendous water pressures in deep seas.



The underwater "robot" of Capt. Bowdoin. Note the electric lamps, suspended on a beam which can be moved at the will of the diver. Top photo, in corner, shows diving cylinder for submarine exploration and photography, driven by propellers.

carrying $3,000,000 in gold bullion.

The big prize of them all, however, is the Vigo Bay plate fleet, which went down in 1703 with $100,000,000 worth of gold and silver ingots—the largest known lode of "drowned gold." The fleet consisted of Spanish galleons carrying three year's production of gold back to Spain from the New World. Encountering hostile English and Dutch vessels, the galleons were scuttled by their commanders rather than have them fall into the hands of the enemy. Location of the wrecks in Vigo Bay, Spain, has been carefully surveyed by the Spanish government, which offers 80% of the value to anyone who recovers the gold.

Other treasures besides gold lie ready for recovery from the sea. Simon Lake, inventor of the submarine, mentioned a few paragraphs back, says there is big profit in salvaging coal from the sea. Millions of tons have been lost in Long Island Sound alone. On one occasion Mr. Lake's diver was released from a hatch in a submarine, located a wrecked coal ship, and got to work. In

exactly nine minutes 15 tons of nut coal was pumped from the sunken ship aboard the cargo submarine, which carried it to the surface and transferred it to barges. Simple and profitable and netting a handsome profit!

Gold, silver, and copper remain good for centuries, though submerged under water, although ships themselves deteriorate. Iron ships corrode rapidly in salt water and wooden vessels are attacked by a boring worm. One of the most valuable cargoes ever salvaged by Mr. Lake was a boatload of copper which sank off Hamonassett Point, Long Island. Incidentally, there are more than 30 ships which went down in the waters of Long Island Sound, of which Mr. Lake has record, which

This diving device is known as the Sisson deep sea bell. Because of its spherical shape, it can descend as far as a quarter of a mile under water. Note the propellers, lights, and buoyancy tanks.

are worth salvaging. Here's a new Captain Kidd's stamping ground.

Hazards of searching for submarine treasures are, in Mr. Lake's opinion, insignificant. He has never heard of a single diver, attired in a regulation suit weighing 200 pounds, being attacked by a shark. He admits that there are octopuses and devil-fish, but a diver rarely meets one of these creatures. And of course the diver is always in constant contact with his ship.

The richest successful submarine treasure hunt was that which recovered $35,000,000 in gold from the liner *Laurentic*, sunk off England during the war by a German submarine. The ship went down in something over 200 feet of water. At first, attempts to salvage her contents failed, but eventually successful contacts were made, and every piece of gold was recovered—a remarkable record. Not a single coin was left for Davy Jones.

A portion of the gold contained aboard the *Lusitania* has also been recovered, but the breaking up of the ship and the burying of its parts under seas of impenetrable mud and sand made a 100% recovery impossible. The liner *Titanic*, which went down in 1912 after striking an iceberg, sank in 1500 feet of water, too deep for salvage operations unless new equipment is perfected. She carried a rich bullion cargo which, like that of other ships, lies patiently awaiting the hands which will recover it.

Youth Invents Gondola Shoes to Walk English Channel

George Terry walking on water with inflated shoes.

THE ancient Biblical feat of walking on water is soon to be duplicated by a Washington youth, George Terry, who has invented an odd pair of gondola shoes to achieve the stunt. The scene of the reenactment of the feat will be the English Channel, between Dover and Calais. For navigating the choppy water, Mr. Terry will employ a special staff which is equipped with an inflated cylinder on the end, that will act as a paddle, or like an Alpine skiier's staff.

The shoes, shown in the photo at the left, resemble miniature canoes, and will be inflated and braced internally to give them rigidity. Foot straps secure the feet in position.

Machine Estimates "Kick" in Story

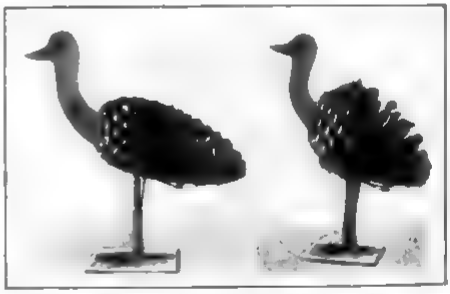
HOW much kick a short story, novel, poem or play has in it can now be determined automatically by an electrical instrument recently invented known as the psycho-galvanometer. The device is connected to a listener and his emotional reactions recorded on a dial. Tests with various authors showed the instrument's effectiveness.

Porkers Fed by Automatic Mother

FINDING himelf confronted with the task of providing nourishment for a litter of little porkers that had lost their mother, a Glens Falls, New York farmer rigged up an automatic mother which seemed to fill the bill quite satisfactorily. The squeals of hunger were quieted by means of a bottle and siphon arrangement, and now the little pigs suckle contentedly from a nipple, as you can see from the photo below.

Little porker feeding contentedly from "automatic mother" which works like a siphon.

Moods of Cone Bird Tell Weather



When fair weather is due the "weather bird" will ruffle feathers as illustrated at right. At coming of storm he will calm down as at left.

MADE from a pine cone, and mounted on a pair of stilts carved to resemble legs, this odd little weather bird will tell you just what kind of weather is in the offing. When fair weather is due, the bird will bristle up as if it were angry, but when a storm is somewhere near, it will quiet down and smooth out its scales. A realistic head should be carved and glued to the end of the cone. Hot dry air causes the leaves to ruffle up; stormy air causes them to settle.

Radical Design Plane Has Twin Rudders on Nacelle Booms

Promoted for pursuit ship service, this new all-metal plane has double cock pit, with double tail on boom

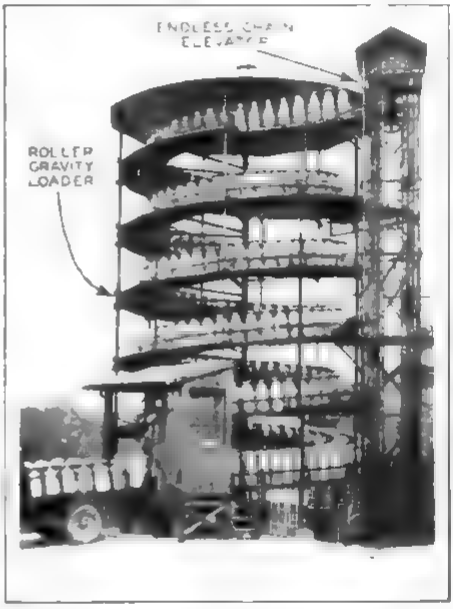
A PLANE featuring one of the most radical design innovations to date has been perfected and successfully test flown at a Detroit air port. Powered by a Continental 165 h.p. motor, the plane is of all-metal low-wing type, with an unusually short nacelle seating four persons in two open cockpits. In addition it has a double tail surface carried on booms leading back from the nacelle. Its inventors hope to demonstrate its value as a pursuit ship.

Clamp for Light Woodwork Jobs

A SERVICEABLE little clamp for delicate woodwork jobs can be made from a ¼ in. carriage bolt, a spool, a couple of washers and a wing nut. The spool should be cut in half and placed on the bolt as illustrated in the accompanying photo. The two washers serve as the jaws and prevent the wing nut from cutting into the spool. For violin repairing the device is ideal. It should be used on small work as illustrated in the photo below.

Work is clamped between the spools as shown here. Washers prevent nut from damaging wood.

Milk Cans Loaded by Gravity Power



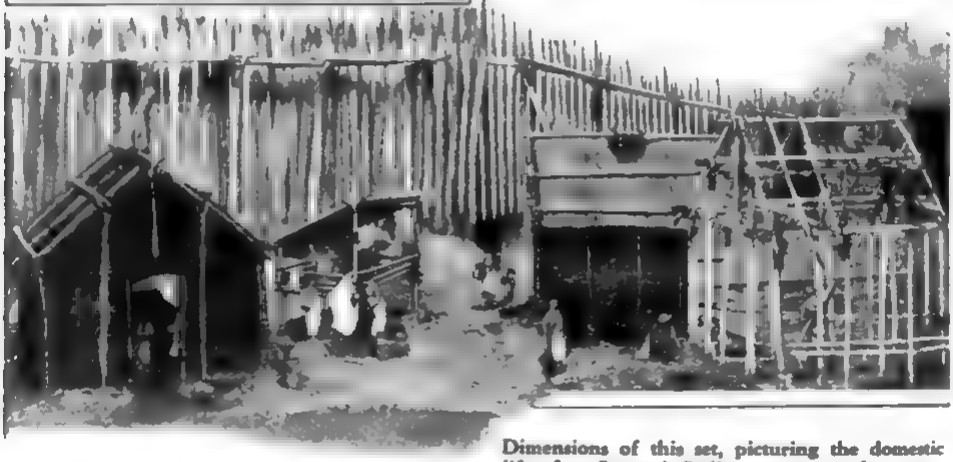
Milk cans are carried to top of this tower and loaded on trucks by gravity power, descending on spiral rollers to receiving platform below.

GRAVITY, without assistance of other power, is employed by a chocolate factory in England for the loading and storing of milk cans. After being elevated by an endless chain to the top of the tower the cans spiral down a roller track to the bottom, where gravity holds them always in readiness for loading and feeds them onto the truck backed up to the receiving platform. The spiral stairway is shown in the photo above. The spiral acts as a store house before cans are loaded.

Miniature SETS Make

by LLOYD S. GRAHAM

Designed with infinite attention to minute detail are the small three-dimension picture sets built by modern museums to depict such scenes as the raising of the pyramids and the temple worship of ancient Mayans. Elaborate methods of construction used in erecting plaster buildings and shaping wax figures into such life-like form that they almost seem to breathe are described here.



Dimensions of this set, picturing the domestic life of an Iroquois Indian group, can be appreciated by comparing this close-up with the photo in the upper left corner where an artist is shown at work on the set. The human figures are cast in wax, and the whole scene painted in natural colors.

MANY people consider museums to be desolate places devoted to the purpose of displaying dead exhibits—stuffed forms of life staring stolidly at one through lacklustre eyes. That may have been true not so long ago, but the judicious employment of men with the souls of artists is making the modern museum a thing alive.

Slaves under the lash of the master, building the Pyramids; Indians hunting, building their homes, felling trees, constructing dugouts; Mayan worshippers at their temples, sacrificial fires burning brightly; delicate pink blind fish and crayfish in the crystal clear waters of an Indiana limestone cave; Filipino natives and water buffalo going about their rice-cultivating tasks on their mountain terraces. All of these scenes in the breath of action, only short of actual movement, are re-created with scientific exactitude and a human delicacy of touch which makes them very much alive. They are displayed at the Buffalo Museum of Science.

Let us take one group in detail—the Egyptian group. This is designed to depict accurately the building of the Pyramids. We see in the right foreground the royal party. The king and some of his councillors are on foot. Near and to the rear of them are the slaves of the royal household, some of them bearing the queen in the royal chair. Just beyond them is a small valley, green and fertile, with palm trees rising majestically out of it. And just beyond the valley—it seems a half or three-quarters of a mile in perspective—is the plain.

Museums Come to Life

Worshipers at the ancient Mayan city of Tikal are shown streaming up the steps of a temple in this remarkably detailed scene. Sacrificial fires are reproduced by a hidden light bulb, as shown, shining through bits of red glass.

Not only the fish, but the under-water foliage shown in this marvelous set, are shaped from wax, tinted to natural colors.

On this plain at the left is a partially completed Pyramid with bricks of dried mud leading from one level to another and, at the base, a long, broad ramp leading across the plain to the valley of the Nile and the Nile River below, shimmering in the distance at the extreme right of the group. In the distance are other completed Pyramids. On the Pyramid under construction, and the ramp leading to it, may be seen thousands of toiling slaves. All very real, and a step-back of several thousand years as one looks. You see in the making King Khefran's Second Pyramid, 3,000 B. C.

Months of work by experts have gone into this group. First a sketch is drawn. This determines the general layout. And from this a working model of cardboard and paint is built. Scientific works are assiduously studied for details, figures, measurements and a thousand and one minutiæ. With rough conformation to the ground contours which are to come later, the base is built up solidly

Here is depicted the ancient Javanese temple of Boro Budur. Each of the scores of minarets in the completed temple was individually cast in plaster and assembled. Note the wooden blocks on which the wire screen which serves as a base for the model is mounted.

Every frond of this miniature palm tree was individually cut by an artist. Proportions must be carefully figured out so that the completed scene is true to scale, with nothing to mar the illusion.

out of two-by-fours, covered with fine mesh hardware cloth. The back of the group is painted to simulate sky or a portion of the scene and so cleverly done that when the group is finished it will be difficult for you to tell just where the modeling ends and the painting begins.

The hardware cloth is covered with papier mache, compounded of plaster of Paris, glue and wood pulp, and moulded into the desired contours. This is the best material for the purpose, better than plaster alone, because the glue prevents it from cracking. Then they are ready to build up the details. With the measurements and proportions decided upon, the details are worked out, not at the group but in work rooms where they are less likely to be disturbed and where ample equipment and supplies are at hand. The Pyramid as it is to appear under construction is worked out with modeling clay. When this model is satisfactory the real model to be used in group is cast in plaster of Paris from a plaster cast of the clay model. This is then placed in the group with great care.

The thousands of slaves and overseers whom one sees upon the long ramp and the Pyramid itself are cast out of type metal. The huge stones which they are hauling are cast of plaster. The seemingly huge palm trees are made up out of wire, green tissue paper and wax. The wax is in true color for whatever purpose it is used, and not painted. The fronds are wax and tissue with the exception of stem and rib, which are of fine wire. As a finishing touch they are gone over with an air brush.

Sargasso Sea Model Shows Wax Weeds Floating at Surface of Ocean

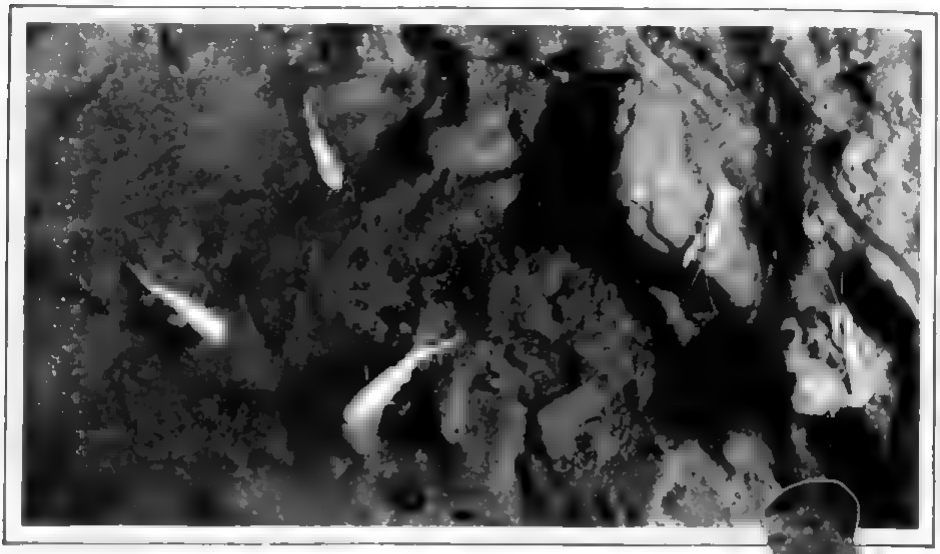
The marine vegetation floating from the surface in this under-water scene is a marvel of detail, being done completely in wax. The group of weeds at the extreme right contains 500 seed pods, each cast in wax.

Egyptian scene in process of construction. In making the human figures, a clay model is sculptured, a plaster cast made, and wax poured into the cast. Every tiny detail is planned in advance.

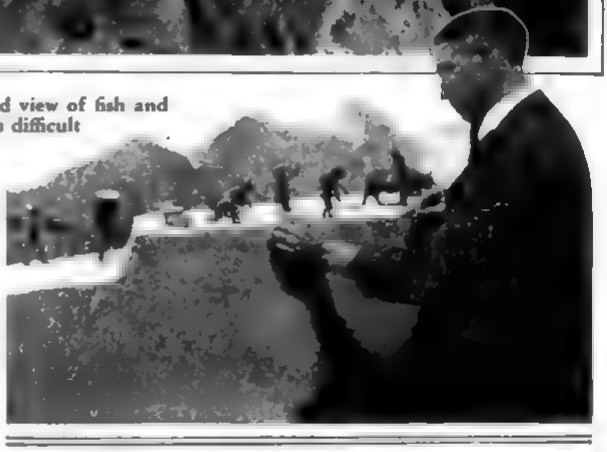
The figures in the foreground present another problem. In true perspective, they must stand out. So they are three and one-half inches high. There are several of them and each one is doing something. From the preliminary sketch, poses are determined. Clay models are made from figures in appropriate poses. Many of these must of necessity be in the nude. Lacking models, the artists must work from detailed photographs of models in appropriate poses.

After each figure is satisfactorily done in clay, a plaster cast is made of it, wax is poured into the cast, and the completed figure, except for detail touching up, is ready to be put into its place in the group. Before the foreground group is placed, however, the entire papier mache base and plaster Pyramid, type metal slaves and plaster stone, have been painted. The plain shows dun-colored and hot with sunlight while the valley of the Nile and the small valley in the foreground, with the palms, is coolly green. A plate-glass frame is placed vertically, or perhaps at a slight angle from the vertical, in front of the whole group. You see a perfect panorama of Egyptian life. In the middle distance, the broad ramp from the Nile to the Pyramid seems 900 feet long, but it is only six feet, three inches.

The Egyptian group was worked out by two artists, H. Brainard Wright and Herbert Maier. They did the Boro Budur group, showing several figures, an elephant, foliage and trees in the foreground, and in the middle distance the massive multi-towered shrine. They did the Mayan temples at the city of Tikal, with scores of devotees in wax and its two temple fires burning brightly.



So strikingly realistic is this overhead view of fish and crayfish swimming in a pool that it's difficult to believe the rocks are made of plaster and the fish of wax.



These figures will be used in a scene showing Philippine customs. Sometimes type metal is used in casting figures, instead of wax.

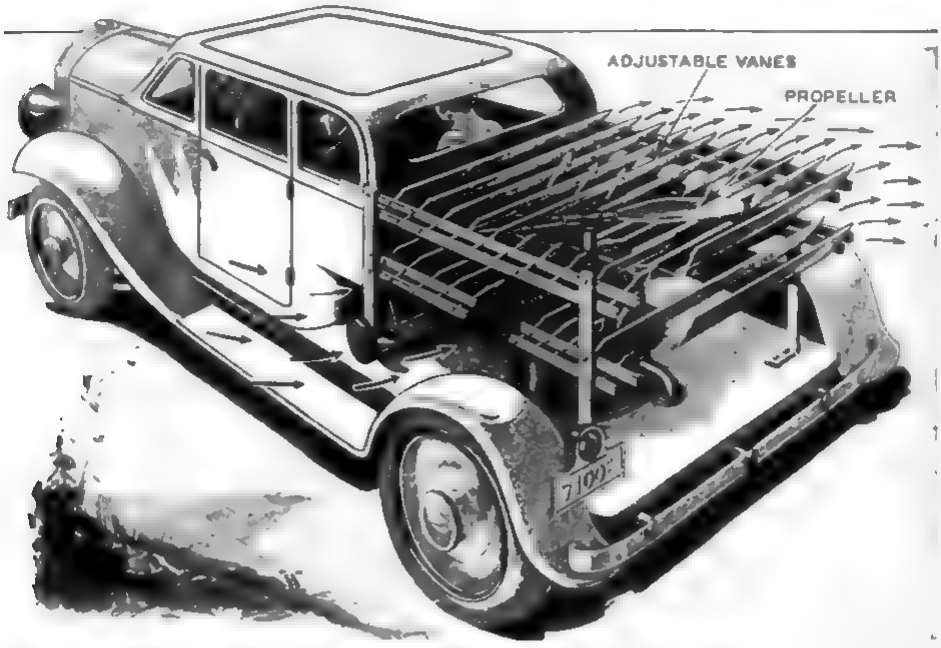
They are now doing a series of groups on early agriculture and civilizations based upon various phases; wheat in the Egyptian, described in detail, corn in the culture of the Hopi Indian, and others, including rice in the Philippines. In the latter group there is a scene of terraced mountains under cultivation, with several figures in the foreground in various acts of rice cultivation.

One of the largest and most impressive groups is that of the Iroquois Indians. Here a tremendous amount of detail and faithfulness in reproduction bares to the eye in a few seconds a wealth of Indian lore: An Indian felling a tree by burning, another returning from the hunt with a turkey, Indians stripping bark from trees to cover their houses, Indians digging and burning out a canoe, Indians in the activities of house and barricade construction, Indian women going about their domestic duties, children at play, babies: an astonishing result of the proper use in the hands of artists of wax, wood, papier mache, moss, wire, paint and a multitude of other materials.

Outstanding work in this line is also being done by two brothers, George and Paul Marchand. They are particularly proud of the Sargasso Sea group. Here, you look into the sea. The top of the group is the seaweed-strewn surface of the blue water. In this, floating and attached to the seaweed are 65 forms of animal life—fish, crustaceans, and so on—all done in wax. Moreover, the seaweed—thousands of casts of leaves and seed pods—is in wax, held together with wax-dipped wire.

Another odd group by the Marchand brothers is that depicting a cave like those to be found in the limestone district of southern Indiana.

Propeller-Drive CAR has VANE Control



Driven by windstream of horizontal propellers located in position of rumble seat, this new auto, invented by Berlin aviation engineer, maneuvers with utmost flexibility in heavy traffic. Adjustable vanes, slanting to rear, drive car forward. To go into reverse, vanes are slanted forward by driver.

CARRYING the development of air driven automobiles a step farther, Emil Sohn, a Berlin aviation engineer, has invented a motor car that secures high flexibility of control from power of an airplane motor and twin propellers located in the rear, in the position of the rumble seat.

The propellers are mounted horizontally, the windstream being directed by means of adjustable vanes like the blades of a steam turbine. The powerful windstream tends to push the car forward at a tremendous speed when the vanes are set for "forward," that is, slanting toward the rear. To go in reverse, the vanes are slanted forward, so that windstream pushes the car backward.

Chief among the advantages offered by this method of propulsion are: utmost economy; the ability to climb steep mountain grades; smooth passage over roughest of roads; and the elimination of all danger of skidding on wet or icy streets, due to downward pressure on wheels exerted by upward windstream.

Hand Signal Light for Motorists

EVERY year a large number of auto accidents occur because drivers fail to notice signals. A simple device, the hand signal light, recently invented, helps to make driving safer, especially at night.

If the driver ahead wishes to make a left-hand turn, the driver behind will be able to see the signal. As soon as the hand is extended, lights from the car in the rear strike the red glass, which makes the signal clearly visible. The signal light is worn like a wrist watch, as shown at right.

Light striking wrist signal tells driver direction of turn.

BELIEVE IT or NOT!

Anyone doubting the truth of these statements can obtain proof by writing to Robert L. Ripley, in care of Modern Mechanics and Inventions, 529 So. 7th St., Minneapolis, Minn., enclosing stamped envelope.

by RIPLEY

Strange and Startling Facts that Challenge Belief

How can eight messages be sent simultaneously over one wire? How can a plane fly two directions at once? How can water flow uphill while falling downhill? Write Ripley for explanations of these freaks.

Stage Challenges Movies

Three revolving stages and one top-stage setting present four scenes simultaneously—a feat not yet successfully duplicated by the movies.

Man power is used to turn the revolving stages. Large center stage is in background, with smaller stage at extreme right.

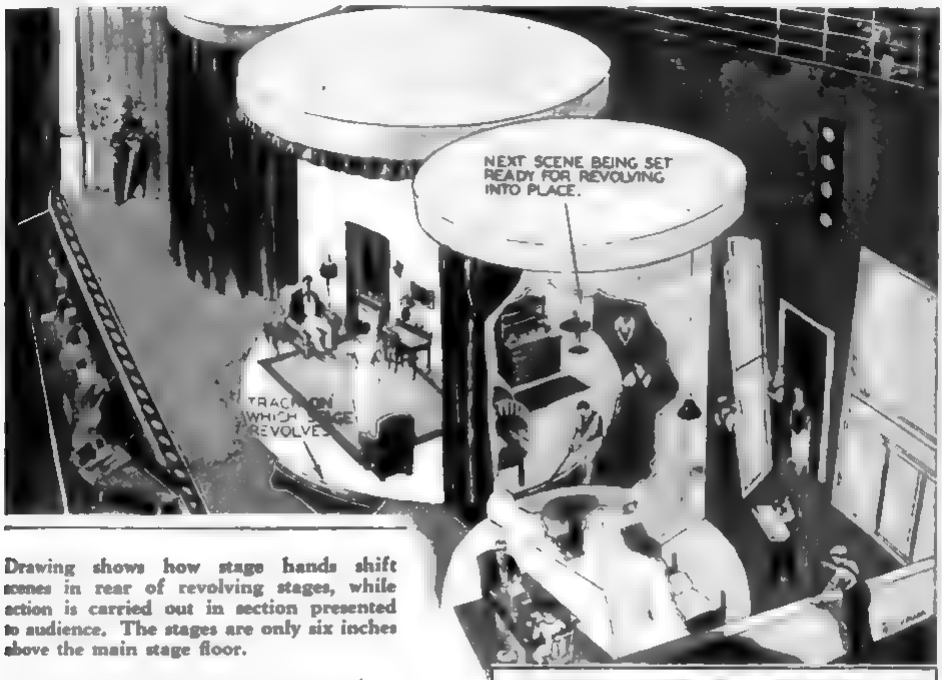
At last the legitimate theater is able to duplicate the rapid-fire changes of scene which have given the motion picture an inestimable advantage over the stage. Through the use of revolving settings scenes are shifted instantly.

FOR the first time in all its history, the legitimate stage is able to rival and even to outstrip the motion picture in its ability to present swift changes of scene to the eyes of an audience. In the past it has been the movie alone which could shift instantly from a desert setting to a polar scene, but now the legitimate theater is not only able to duplicate such a performance, if it wishes, but it can also present as many as four different scenes to the eyes of the audience simultaneously—a feat which the movies have not yet found practical.

Revolving stages and ingenious mechanical devices have given the "legit" its latest advantage in eternal competition with the talkies to win the favor of audiences attuned to the speeded-up tempo of modern life. The revolving stage idea is not new, but its development as worked out in productions by J. J. Shubert and A. H. Woods is far above anything ever before attempted.

In Mr. Woods' production of "Five Star Final" *three* revolving stages are used, in addition to a setting above one of the stages showing a telephone operator's booth—four

with Revolving SETTINGS



Drawing shows how stage hands shift scenes in rear of revolving stages, while action is carried out in section presented to audience. The stages are only six inches above the main stage floor.

scenes, all presented at the same instant. In the Shubert production of the operettas "Three Little Girls" and "A Wonderful Night," only one revolving stage is used, but it is so huge that it is turned by electric power, and can be disassembled for shipment—the only portable stage of its type ever built.

Simple as the idea of a revolving stage appears, countless obstacles had to be overcome. P. Dodd Ackerman designed the stages for "Five Star Final." He found that he could use three stages, a center one of 23-foot diameter, and two side stages of 13 feet. But the usual method of stage lighting, in which cables for electric current are laid on the stage floor, would not suffice, since the revolving of the stages would wind up the cables. This complication was solved by running the lines through a hollow pivot at the center of each stage. Dimensions of the theater had to be carefully checked up to make sure that the stages did not conceal the action from any part of the audience. Silent

Here is shown the sectional construction of one of the small revolving stages used in "Five Star Final." Wires for the electric lights run up through a hollow tube in the center of the stage.

The audience is watching a scene from "A Wonderful Night." Actors are dancing in a garden cafe setting, while scene shifters at rear are setting up a house interior, ready to revolve into place. A motor is used for turning.

You are gazing on a speakeasy setting from "Five Star Final." In a few seconds the men revolving the turntable will have revealed the opposite side of this scene to be a lavish apartment setting.

tracks were devised to make the revolving of the settings absolutely soundproof.

Each of the three stages was provided with a separate curtain, and each was divided into three sections, like a pie cut into three equal parts. While one section is presented to the audience, stage hands change the settings on the two sections which are backstage. The curtain is dropped; strong arms pull the revolving stage around—and presto! The section which a moment before was presented to the audience is backstage and is being converted from an apartment room to a beer garden, while the action of the play is being carried on in one of the other segments of the stage.

With three separate stages, each divided into three sections, and an additional setting on top of one of them—viewed through a screen—the rapid-fire changes of action which can be presented are numberless. Usually only one or two stages are in use at the same moment, but when the action calls for it they can all be brought into service.

The "Five Star Final" revolving stages rest on the floor of the main stage, and are turned around on wheeled tracks. The Shubert portable revolving stage is mechanically more complicated. It can be likened in its operation to a huge phonograph disk, revolving on an axis which extends downward through the regular theater stage floor, connecting with a huge motor in the cellar. One man controls the turntable in response to buzzer signals from the stage manager.

In the second act of "A Wonderful Night" the entire seven scenes are set on the turntable at one time. The scenery used is double; that is, painted on both sides. When the scene is shifted the curtain is not lowered, but assumes something of the aspect of a motion picture screen, in which the characters walk from one room to another in full view of the audience. In one act the audience sees a group of characters step from a room, reappear in a street, continue down a moonlit lane and enter a cafe, in natural movement and in correct elapsed time. James H. Surridge, chief of the Shubert mechanical forces, supervised the construction of this remarkable stage.

Other ingenious stages have been used by theaters to overcome the limitations of the usual opera house. The Boston Opera has hydraulic stage worked somewhat like an elevator.

Motor Car Dragons Help Earn a Living for Their Owners

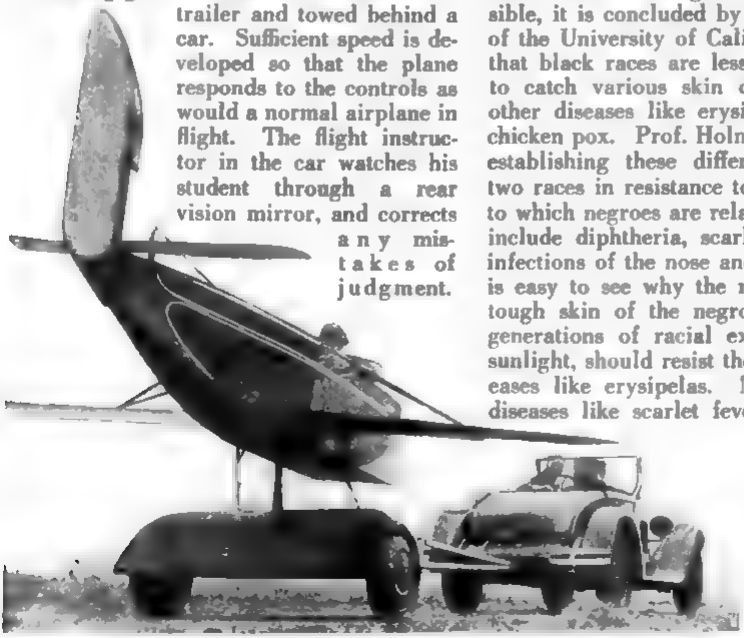
TERRIFYING in aspect and noisy enough to wake the dead is the dragon wagon built by Fred Jolly, Indianapolis airplane designer. Jolly is solving his unemployment problem by becoming a modern town crier.

The two dragons, built in imitation of prehistoric dinosaurs, are made of plywood and mounted on both sides of a small sedan. When the car moves the dragons move their heads up and down, open and shut their jaws, and move their feet in a life-like manner. A phonograph inside the car is connected with an 11-foot horn to produce roars and music. The vehicle is rented out to attract attention to processions, and for similar purposes.

Moving heads, necks, and legs and roaring through a loud speaker, these dragons are rented out to lead parades for advertising purposes. They are patterned after prehistoric dinosaurs, and get their motion from the rear wheels of the car.

Tow Car Teaches Flying

LATEST in the way of flight instruction devices is the Hawk trainer pictured below, in which an airplane complete except for landing gear and motor is mounted on a trailer and towed behind a car. Sufficient speed is developed so that the plane responds to the controls as would a normal airplane in flight. The flight instructor in the car watches his student through a rear vision mirror, and corrects any mistakes of judgment.



Taking a leaf from glider training methods, this airplane trainer is towed behind a car at speeds where it responds to the controls like a plane in flight.

Negro Skins More Germ-Proof

THE difficulty that germs have to get through a negro skin as compared with the relative ease of penetrating the softer and thinner covering of the whites is responsible, it is concluded by Prof. S. J. Holmes of the University of California, for the fact that black races are less likely than whites to catch various skin diseases and a few other diseases like erysipelas, measles and chicken pox. Prof. Holmes reports statistics establishing these differences between the two races in resistance to disease. Diseases to which negroes are relatively immune also include diphtheria, scarlet fever and germ infections of the nose and of the sinuses. It is easy to see why the relatively thick and tough skin of the negro, tanned black by generations of racial exposure to tropical sunlight, should resist the germs of skin diseases like erysipelas. Negro resistance to diseases like scarlet fever or diphtheria is less easy to explain, but Prof. Holmes believes that this is because the lining of the human nose and mouth and of the upper part of the throat is similar in nature to the outer skin.

New Typewriter Attachment Counts Words Automatically

The new word counter for typewriters, shown in the circle in the photo above, counts one word every time the space bar is depressed. When a new manuscript is started the device can be reset at zero by a simple operation. The device is extremely handy for authors, journalists, and stenographers.

A WORD-COUNTER now on the market eliminates errors when the length of a manuscript or other typed work is roughly estimated from the number of pages and at the same time makes unnecessary the tedious and time-consuming effort of counting the words in the customary manner. The meter, shown in the photo at the left, is located above the "ribbon change" at the right of the machine, where it is out of the way, and counts one word every time the space bar is depressed. The device can be reset at zero when a new manuscript is started. It can be fitted to any standard make of typewriter, and is especially handy for authors, journalists, public stenographers, and others who labor at writing machines.

Pocket Tape, Steel Rule in One

A SIX foot rule combining the convenience of a roll pocket tape and the utility of a steel rule has just been put on the market by manufacturers. Made of high quality tempered steel, stiffened by a special process, the tape automatically winds into a sturdy nickle plated case only two inches in diameter. Objects of any shape can be accurately measured.

The new six-foot measure combines convenience of tape and utility of steel rule.

Odd Traffic Signs Warn Motorists

The diamond-shaped traffic signal with blinker now used in Philadelphia to warn motorists.

ESPECIALLY designed to command instant notice of motorists, a new type of traffic signal, recently put into use in Philadelphia, is shaped like a diamond and equipped with a blinker light to give additional warning. The signals are installed at all corners likely to prove hazardous to speeding motorists.

Mechanical Barroom Dispenses Drinks by Coin-in-Slot

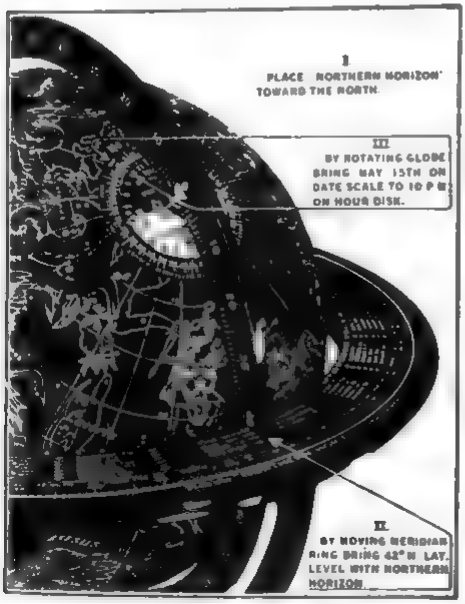
AND now comes the mechanized barroom in the form of an automat that dispenses any liquor you may wish by simply inserting a coin in a slot. (Don't get excited—it's in Germany.) Displayed recently at the Great Fair in Leipzig, the device has a row of spigots fed by tanks containing all choice liquors of every vintage.

Above photo shows the mechanized barroom displayed recently at Leipzig Fair in Germany. Customer quenches his thirst by placing coin in automat slot, then holding glass under spigot. The machine dispenses all choice drinks.

Celestial Globe for Star Students

INCORPORATING features never before applied to a globe, a new celestial globe and star finder which has recently been put on the market by a well known map company will prove a great boon to amateur astronomers. By means of these new features, three simple adjustments, made in as many seconds, make the portion of the globe above its horizon ring correspond exactly with the sky above the observer's horizon, so that even a beginner can identify the visible stars with ease and certainty.

A simplified method is employed for adjusting the globe for the latitude of the observer's position, and an auxiliary instrument called an "altitude and azimuth finder" enables the observer quickly to determine star positions.



The Rand McNally celestial globe and star finder which makes star study easy for beginners.

Sugar Moon Dial Tricks Observers

A SAN FRANCISCO confectioner played a neat trick on his customers with a moon dial displayed in his window. But one night when the moon failed to shine the clock, made, by the way, entirely from sugar, kept on telling time just the same. Later it was discovered that the confectioner had arranged lights in the interior in such a manner that the joke went undetected.

Made entirely of sugar, this moon dial fooled customers by clever arrangement of lights in interior.

INSECTS Teach Man

This Polyphemus moth, magnified by photomicrographic camera, has supersensitive "radio" ears in form of hair antenna.

How sound waves guide bat.

by

Uthai Vincent Wilcox

Amazing inventions perfected by tiny creatures of the insect world have long baffled scientists, who are studying the remarkable accomplishments of "bug" architects, chemists and engineers to find solutions for their scientific problems.

Nature's master camouflager — the Ceylon "Walking Stick." Because of its ability completely to conceal itself against tree leaf or limb, very few of these insects have ever been found, even by naturalists. Note resemblance to leaf.

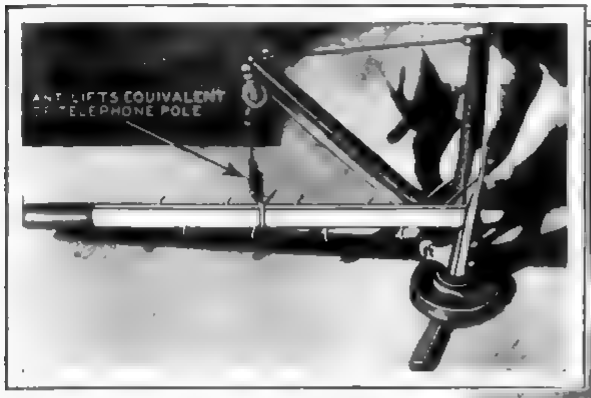
NATURE is, above all, an inventor. She invents new devices, new processes, new ways to meet situations. Many of her amazing inventions are still fascinating mysteries. Scientists know about them, but they are unable adequately to explain them.

Exploring the insect world, investigators have come upon scientific feats performed by the tiny creatures that have proved nothing short of marvelous to engineers, architects, chemists, and even statesmen.

Bees, for example, possess a super-knowledge of chemistry, and they show, as well, an astounding ability to learn and remember. The ordinary honey bee is not easily fooled when out foraging for food. Dr. Frances L. Long, of the staff of the Carnegie Institution of Washington, made a series of extensive experiments in Colorado. He disguised the flowers, he concealed brightly colored parts, he removed petals, he added honey and perfume, he made artificial flowers and painted ones, yet, except for rare instances, the bees were always able to distinguish the real flower from the artificial one, although appearances and even odors were identical.

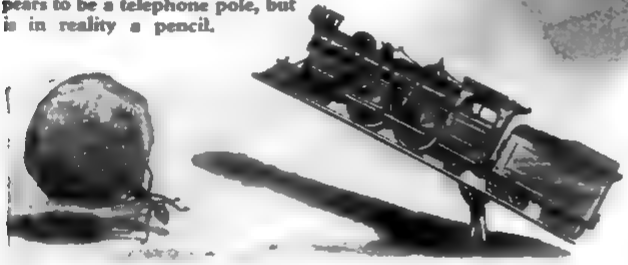
In his experiments he inverted some of their favorite flowers, thus making it difficult

SECRETS of Invention



A startling demonstration of the ability of the ant to lift enormous weights. Here this tiny Hercules is lifting what appears to be a telephone pole, but is in reality a pencil.

A Mason wasp, a potter of unequalled skill, building the multicolored clay jug in which it hatches its eggs. The eggs are preserved after laying by a thin layer of acid, allowing parent to tend to other matters.



If man had strength proportionately equal to that in the ant he would be able to lift a 240,000 lb., or 120 ton, freight engine and carry it two miles! Skyscraper girders would be like toothpicks.

for the bees to enter to secure the honey and nectar. This, however, did not disturb the bees over-much. They immediately adapted themselves to a condition not found before. The bees would land at the lower sepals, turn around and enter upside down. Others mastered the problem quickly by going to five inverted flowers in succession and turning upside down just after landing, a sort of looping-the-loop method.

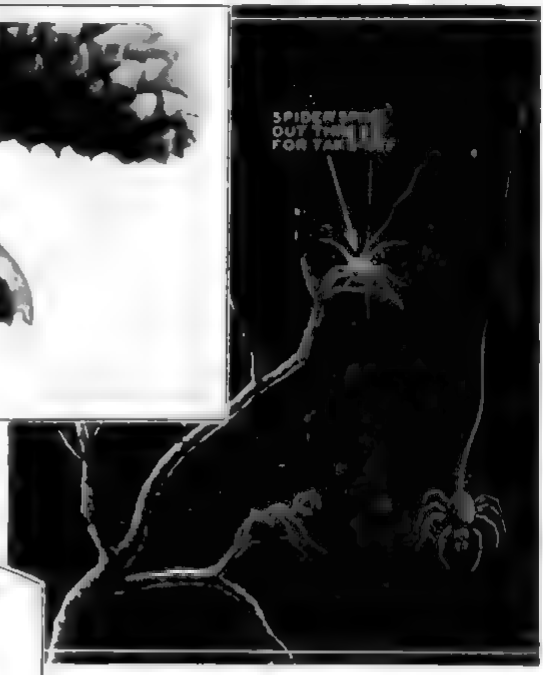
In other experiments the darting humming bird succeeded in twisting its neck about and altering its position from normal and achieving its objective.

Dr. Austin M. Clark, renowned scientist of the Smithsonian Institute, has spent the most fruitful years of his life investigating the habits of thousands of living creatures. He finds that the highest forms of civilization attained by man rest upon slowly acquired knowledge which is most nearly approached not by mammals but by insects.

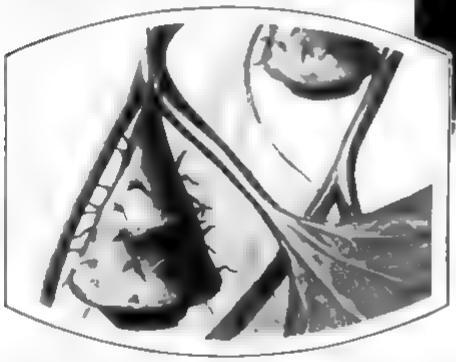
It is true that birds and mammals have practices in common with the more civilized races of men. The complicated engineering achievement of beavers is an example and the physical structure of the bird's body is another.

For example, a bird must be able to roost, tuck its head under its wing, and sleep—all without danger of falling off the perch. The mechanics of Nature's method in making this possible is an example of the skillful adaptation to conditions. The cord which operates the toes of the bird is made extra long and broadens into a muscle. It reaches from hip to heel, running over the knee in front and in a spiral direction around the bone of the lower leg and then over the heel behind. As a result of this rigging over opposed joints

Where other insects use sound and sight as a medium of communication, this Sphinx moth uses its keenly developed sense of smell to talk with fellow bugs.



Some species of spiders are expert aeronauts. When taking off on aerial journey they spin out long thread and let go when wind gives sufficient pull. To descend, they pull in thread and thus reduce the buoyancy of their unique little craft.



An insect citadel—the ingenious armoured house in which cocoon of the tropical moth is protected from enemies. The silken cone is equipped with several dozen fine silken thorns, and hung from silk thread ten inches long attached to the apex.

the bending of the leg serves to put the muscle and tendon on the stretch, but when the bird settles down to sleep the weight shortens the tendon by drawing the toes together, and the bird is automatically clamped to the perch so that it can't fall. This is Nature's patented roosting device.

In the case of the stork, Nature has provided a self-acting lockjoint. The stork walks on stilts—hinged stilts—a feat that would test the ingenuity of an acrobat on any stage. But due to the invention the stork's leg is made so the lower part fits into a socket, the hinge is thrown out, and there is no danger of falling or bending. The stork can even go to sleep resting on one stilt.

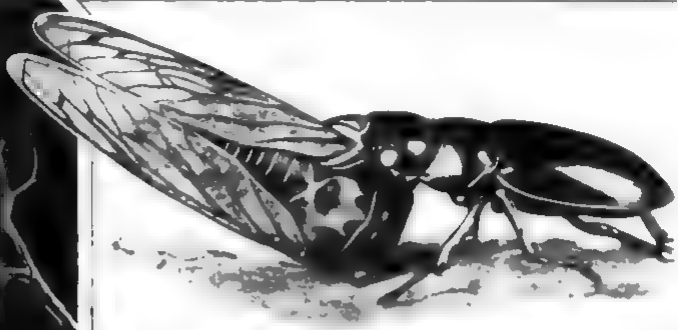
Insects, however, make much broader applications of the principles of physics and chemistry than do most of the mammals, Dr. Clark finds. These are the two sciences that have been largely responsible for man's advancement.

Wasps learned to make paper long before man acquired the art, and the parasite varieties employ the principle of asepsis with astounding skill. One species, before laying eggs on a caterpillar or spider, paralyses the victim with an injection of formic acid which at the same time preserves the victim from decay. Another kind of acid protects the eggs themselves with a thin layer of chemicals when deposited and allows the host to go on with business as usual.

It has been said that man is the only creature that uses tools, yet bees and wasps utilize various implements. Some digger wasps pat down the earth with small sticks or stones after filling in their holes. Honey bees have special adaptions of legs and muscles that are in effect tools. The stinger itself is a

Birds Equipped With Automatic Toes That Clamp on Limb During Sleep

This cowboy of the insect world, the Magnificent spider of Queensland, catches its prey by means of a web lasso holding a drop of sticky fluid, which is tossed over a fly or moth with unerring accuracy.



Above a Stag beetle, wielding a pair of powerful pincers, has captured and killed a locust, which will serve as nest for eggs.

To prevent falling while asleep, birds are equipped by nature with this automatic foot clamp. Tendon controlling toes is rigged over opposed leg joints, so that toes automatically clamp around limb when the bird settles down to a good night's sleep.

mechanical marvel.

Once started the bee's stinger has the power and mechanism to drive itself in, being provided with a self-acting muscle of its own. It is detachable and is even capable of going on working by a sort of pumping motion, and driving itself in after the bee has flown away. It consists of two highly-polished javelins or spears, each having a row of barbs along one side, the two shafts fitting and sliding against one another inside a supporting scabbard. The advantages that man has with the repeating rifle is the bee's also, for the jabbing is continued. On the top of the apparatus is the poison bag which keeps emptying its contents into the wound through a groove between the two sliding spears.

Dr. Clark has discovered that man's vaunted ability to fly is surpassed by the hawk moths, humming birds, and hover flies, who have learned to fly backwards as well as forwards.

The spinning ants of Africa and Australia, although not equipped with spinning apparatus themselves, have learned how to make use of involuntary child labor by pressing their larvae into service, Dr. Clark discovered on one of his exploring trips. When they set out to make their huge nests, they take some of their helpless young and use them as shuttles to sew bunches of leaves together with the liquid silk they contain until the supply is nearly exhausted. Then they return the larvae to their resting place and bring out a fresh supply of living shuttles.

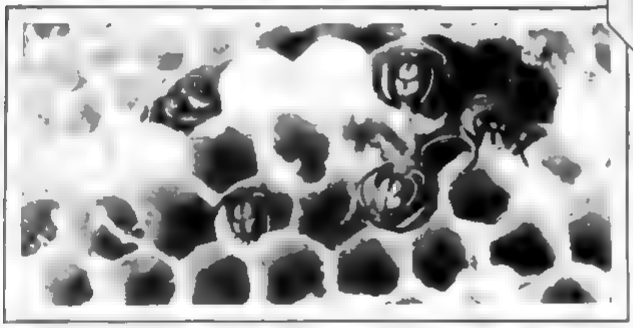
In Queensland there is a spider which hangs head downward by a strand of web and holds in its claw a lasso about an inch and a half in length. The end of this lasso has on it a drop of sticky fluid. When a moth comes in reach the spider whirls its lasso rapidly and skillfully catches the moth on the sticky drop. This spider is called the Magnificent. His skill is not matched by any cowboy of the plains in unerring accuracy.

While Dr. Clark and the scientists of the

No Engineer Has Mathematical Skill of Bees in Laying Out Honeycombs

Dr. John Anderson, bee expert, studying huge bee model.

Bees and moths possess mysterious ability to grow a tongue to any length required in securing nectar or food. Note in above photo long spiral tongue of moth perched with bee on top of cat o' nine tails.



The mathematical skill of bees in laying out their honeycombs is nothing short of marvelous. Above close-up shows a group of these busy little insects at work storing up honey in the cells.

U. S. Department of Agriculture spend their lives in studying habits of insects and the smaller creatures, they are confronted by many mysteries, as yet unfathomed.

The Mexican Free-Tailed Bat of the Southwestern states has its mysteries. It is common enough, yet comparatively little is known about its manner of living. The bat flies at night, and yet their eyes are exceedingly small and deeply sunk in furry sockets. The bat flies rapidly, darting here and there and catching moths and night flying insects. Some have thought that the foreheads of the bat are equipped with fine hairs that are sensitive to sound waves and report the echo of a wing beat.

Experimenters once strung fine, black wires in a darkened room and then released a bat along with some moths. The bat was able to catch the darting moths and did not strike a single wire, although they were close together. The bat indigenous to America sleeps during the winter months suspended by its hooked wings. Before doing so the little creature has stored up food to supply the needs of the body. By some process they empty their stomachs and alimentary canals, their temperature falls to that of the surrounding air, and their circulation and respiration become greatly reduced, their bodies becoming cold and apparently lifeless. They hang that way for four or five months until awakened by the warm air of spring, when by some mysterious process their circulation becomes normal and they awaken to dart off as though they had been asleep just over night.

It is not known just how bats and the whole insect world, too, balance themselves. They never become confused, they do not become dizzy, and they can walk upside down and can cling to smooth surfaces. While some have special adaptions in their feet, others equally as skillful do not. Spiders and ants are in this latter category.

In a laboratory at the Interior Depart-

(Continued on page 206)

New All-Tongue Instantaneous Translator

Above diagrammatic sketch illustrates method of using Filene-Finlay Translator at international conventions and assemblies to permit instantaneous translation of speeches in a number of languages. Speaker's voice is carried from stage microphone to skilled translators, who instantly relay the discourse to listeners wearing phones plugged into receptacle on seats.

THE confusion of tongues, the greatest of barriers to understanding between the peoples of the various nations, is now being surmounted by the adoption of a new electrical system of simultaneous translation which makes an orator's speech instantly available in a number of tongues. Invented by Edward A. Filene, a Boston dry goods merchant and active figure in international affairs, the Filene-Finlay Translator, as it is called, proved its practicability at the International Chamber of Commerce convention held recently in New York, and at the League of Nations headquarters in Geneva.

The system is largely made up of standard telephone and radio amplifying units which are used to increase volume and to deliver the voice from a battery of translators to the listeners of various nationalities in the audience. The speaker's voice is picked up by a stage microphone and carried to the translator's center. Speaking through soundproof mouthpieces, these skilled translators render the speech into their own tongue, the voice being carried by cables to plugs on the seats of the listeners in the audience.

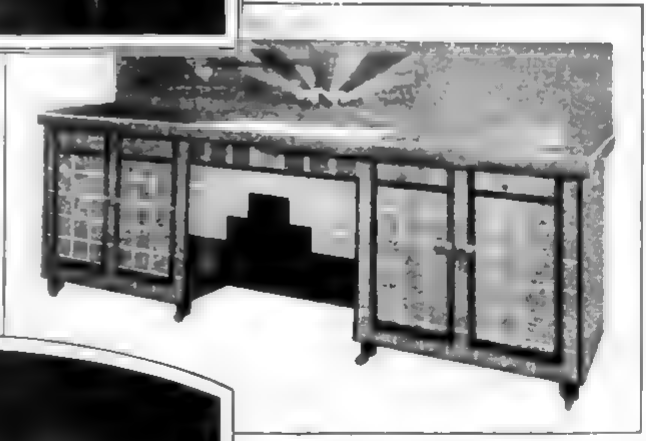
When the speech begins the auditors watch the flasher sign over the speaker's head and plug their headphones in the receptacles designated for their language. The translators behind the scenes follow the speaker closely, so that the listeners can also follow the speaker as if he were talking in their own language. This method eliminates the necessity of redelivering the speech completely in each language, thus saving an immense amount of time and misunderstanding.

Complete equipment to be installed in assembly halls for international conventions is now available and will go a long way towards expediting the settlement of questions of moment to all nations.

LATEST INVENTIONS

For health and comfort in homes, this novel humidifier which throws moisture into air in form of unheated vapor is now being marketed. Electrically driven cone spouts tiny water particles upward by centrifugal force.

Especially effective in clearing head and throat with medicated vapor is this new electric steam vaporizer, which has automatic shut-off that allows patient to sleep in safety.



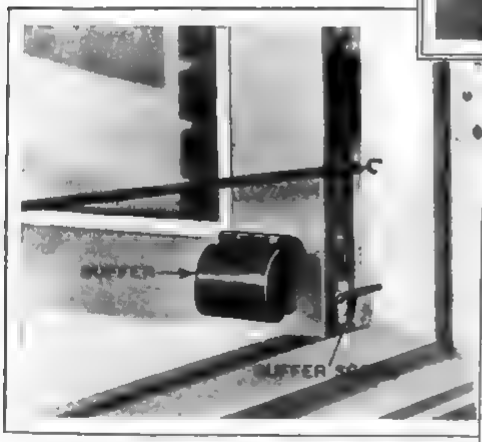
Made of reinforced rubber tile available in thirty colors, these new drainboards eliminate danger of cracked and broken dishes, and cannot be chipped or dented like enamel-covered drainboards. The material is applied to a wood base, resulting in solid, impervious surface, and is not affected by cigarettes, cigars or lighted matches, as colors are permanent throughout entire thickness. Tile is produced under high pressure and heat.

Equipped with long wooden handle, this new holder lifts hot pans from stove by strong alligator-like jaws.

for Household Convenience

Threaded through two parallel rods, garments hung on this new hanger cannot slide to one side and become rumpled when the device is tilted as illustrated.

Of interest to home owners is the new washable cellulose-coated wall paper which resists ink and grease.



The nuisance of banging doors is eliminated once and for all by use of the easily-installed door check shown above. A piston working in a compressed air chamber acts as a buffer, striking a plunger screw in the door jamb. The device may be installed either at top or bottom of the doorway. Right—This labor-saving mechanical vegetable dicer performs the feat of cutting a whole potato at one movement, a mere down stroke of the lever doing the trick. The potato or other vegetable is placed in a holder and forced downward through coarse, mesh-like arrangement of knives.

Adventurers of Science

Roy Chapman Andrews (left), foremost adventurer of science, mapping eroded terrain of Urtzn Oho Bad Lands of Mongolia, where he is seeking the "Cradle of Man."

by ALFRED ALBELLI

Archaeologists, who are as much adventurers as they are scientists, are every day striking out into remote parts of the world in search of relics of mankind's mysterious past. The dangers these explorers encounter, the scientific methods they employ, and the treasures they have unearthed are described in this article.

THE thrilling, zestful days of the old West are almost gone, the North and South Poles have yielded most of their secrets to intrepid explorers, the mysteries of the impenetrable jungles of Central America, Brazil and Africa have been solved by the all-seeing eye of the airplane, and so it would seem that the world holds no more frontiers for adventurers in their quest for the thrills of the unknown.

Howard Carter exploring Tut-Ankh-Amen's tomb.

Explore Mankind's Past

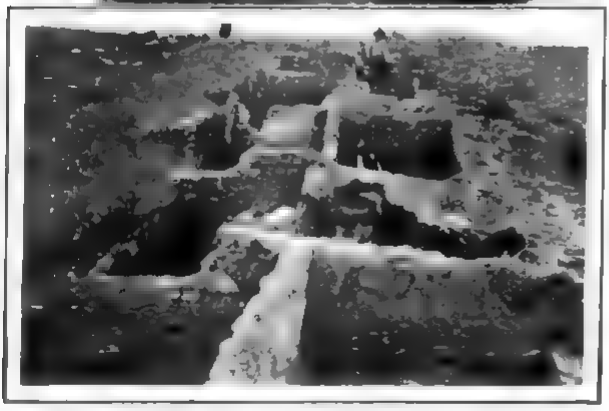
This artist's drawing depicts exploration of long-lost city of Chersonese, sunk in ocean by earthquake centuries ago, by divers who recovered many priceless relics which are believed to be only few of treasures.

Putting feminine curiosity to work. Women of the Lee archaeological expedition to Yucatan, Central America, descending shaft of recently discovered Mayan ruins. These ancient Americans had a highly developed form of civilization, with temples of great architectural beauty.

But modern adventurers need not despair, for the science of archaeology, bent upon solving the mysteries of mankind's past, is now pointing the way to new frontiers in remote regions of the world where buried and long-forgotten cities of antiquity are yielding to stout hearted explorers a rich harvest of thrills and treasures that are inexhaustible.

Employing every resource of modern science available for their purpose, venturesome archaeologists are digging in the

Excavating ruins of ancient Mayan "Temple of the Gods," discovered recently by airplane. Mayan civilization flourished in Yucatan as early as 500 A. D., and was extinguished by invading Spaniards.



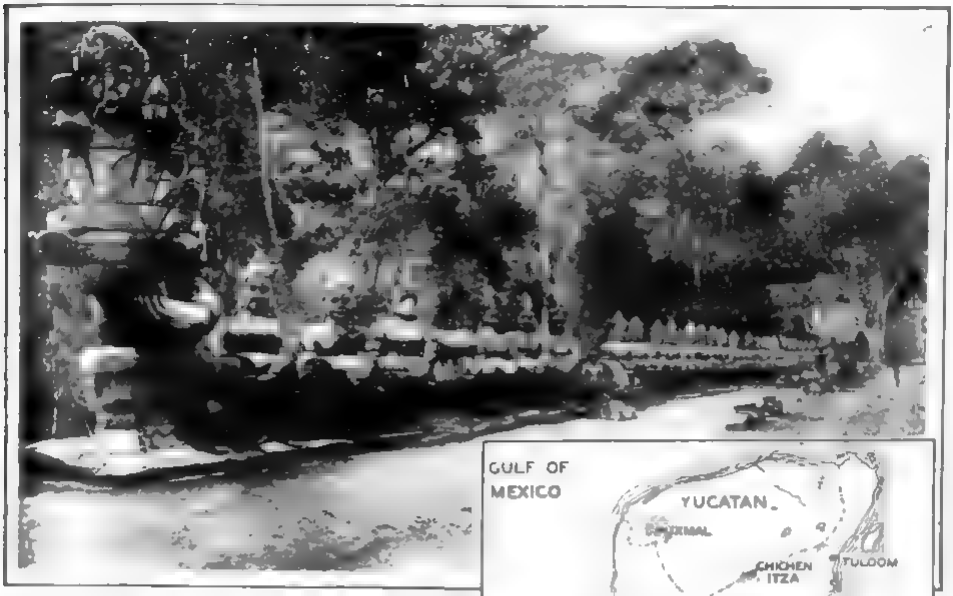
Above—Dinosaur bones unearthed recently in Montana. Below—Ruins of Zuni Indian pueblos discovered recently in New Mexico disclosed remarkable masonry and highly developed form of architecture indicating a well-advanced civilization.

bowels of the earth and bringing to the light of day the lore and relics of ancient civilizations, which flourished thousands of years ago and whose secrets are now being read.

Why is work of this kind being carried on? There is an intense fascination in seeing how mankind lived back in the remote beginnings of the world. Even the most modern and sophisticated person feels a certain astonishment and keen appreciation when some beautiful and precious object, last used some fifty centuries ago, is placed in his hand.

Thanks to the patient labors of adventurous archaeologists, we know far more today how men lived in the remote past, what were their beliefs, their culture, their sports, their wars and intrigues, than the generations that followed them ever knew. What Egypt taught Greece about warfare, navigation, and industry, what the conquering Romans learned from the Greeks in the way of architecture, government and athletics, and what our modern civilization owes to all these nations of antiquity, has been slowly gathered from the graves and ruins that they left.

In recent months excavators digging in the ruins of Pompeii, Italy, a famous city whose life was suddenly snuffed out by a fiery



Thick jungles of Indo-China yielded to explorers this striking religious relic—the famous Sacred Snake of Angkor. Stone figure of the snake, most of which has been destroyed, is carried in hands of the priests, forming immense balustrade.

Regions of the world now of greatest interest to archaeologists. Top map shows centers of Mayan Civilization of Yucatan. Center—Regions inhabited by prehistoric man. Below — Areas prominent in biblical records.

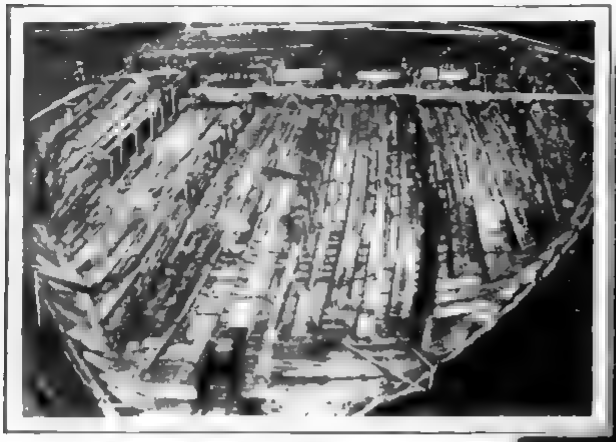
rain of lava from Vesuvius centuries ago, came upon a group of gold and silver objects worth over $1,000,000.

From other corners of the earth comes the news of discoveries that have roused intense enthusiasm in explorers and their sponsors. The diggers of ancient lore, it seems, are in for a bull market. It has been conservatively estimated by H. Phelps Clawson, the noted excavator, who aided in bringing to light the tomb of Tut-Ankh-Amen eight years ago after it had lain hidden from civilization for over 3,000 years, that the year 1931 would see over $50,000,000 expended to unearth the secrets of bygone centuries.

Mr. Clawson also declared that the possibilities for improvement in the mechanical aids used to penetrate to the hidden vaults of antiquity were limitless.

"The amount of money required to carry out such a work," he said, "depends upon where you are working and the size of the staff you maintain. An expedition in a fairly permanent location will need an equipment consisting of dump-cars, yards of track, engineering implements, chemicals for preserving the finds, photographic supplies, and a thousand and one things that are used in scientific research.

In connection with the discovery of the



The pleasure galley of the mad Roman Emperor Caligula, recovered by Italian Government after draining Lake Nemi, in which it was sunk 1900 years ago. Legend declares that Caligula deliberately scuttled the galley, with all guests on board, to crown an orgy.

Method of heating homes in ancient Rome was disclosed in ruins of baths excavated recently at Ostia, Italy, at mouth of River Tiber. Ruins gave a wealth of material throwing light on Roman maritime usages.

tomb of Tut-Ankh-Amen, Howard Carter, another eminent archaeologist who figured conspicuously in its discovery, announced recently that the tomb of that Egyptian monarch had been thrown open to the public as the last gesture in one of science's greatest adventures. Ironically, the Earl of Carnarvon, the leader of the Tut-Ankh-Amen expedition, perished in the midst of operations.

Turning eastward from the Valley of the Tombs of the Kings, we find that the diggers are as busy as beavers unearthing the tombs of the ancient kings of Ur, and on other sites in the Tigris-Euphrates valley.

The joint expedition of the British Museum and the Museum of the University of Pennsylvania not long ago brought to light the burial places of three kings of Ur. Horace H. F. Jayne, director of the Pennsylvania museum described this site as the most monumental ruins in Mesopotamia. The oldest of the tombs date back about 4,300 years.

Mr. Jayne pointed out that the expedition had centered its attention upon these tombs at Ur for nine seasons. The excavation was made difficult, he said, because the enormous mudbrick walls which Nebuchadnezzar built around the sacred area ran directly across the site and had to be dug through.

"Below these," he went on to say, "are also private houses of about the twentieth century B. C., and it is only when they have been cleared away that we can lay bare the work of the third dynasty of Ur. Some of the buildings have solid walls of burnt brick laid in bitumen, with square and rounded buttresses along the outer face."

Some of the resourcefulness of these diggers, in combining science and mechanical skill and ingenuity, may be gleaned from the recent operations carried out on the site of an ancient Greek settlement called Chersonese, and described in the writings of Strabo, a Greek geographer.

A group of Russian archaeologists, baffled after months of excavating on what they had divined to be the site of Chersonese, decided to look under the sea, near the modern Crimean city of Sevastopol for the long-lost city. This was after fishermen had spread

(Continued on page 202)

Aquaplanes Carry TENNIS to Sea

IT JUST had to come! With a mile-long waiting line at the public tennis courts of most cities, the devotees of the sport just had to find some place to play; and as a net across the pavement might interfere with traffic to a certain extent there was no place left except the wide-open spaces of lake, river, ocean, or what kind of water have you in your neighborhood?

Aquaplane tennis, which started in the South last winter and rapidly obtained a foothold at the northern resorts during the summer, requires three speed boats, two aquaplanes, four bathing beauties and a lot of water. If the service is rotten you can always go swimming. It's a great racket even if it is all wet!

Three sports in one. It starts as aquaplaning, becomes tennis as you pass the camera, and then you go swimming.

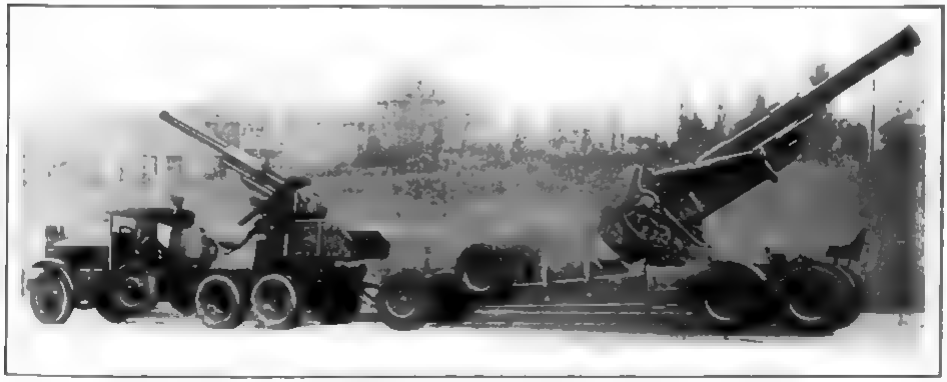
Repairing Gas Line With Tape

IF THE gas line breaks when on a motor trip, wrap a two-inch piece of tape over the break. Next take a longer piece of tape and start several inches from one side of the break, wrapping to the other side and back in spiral fashion. Continue until you have built a wall of tape approximately ⅛-inch thick. This will hold temporarily.

Army Has Speedy Artillery Unit

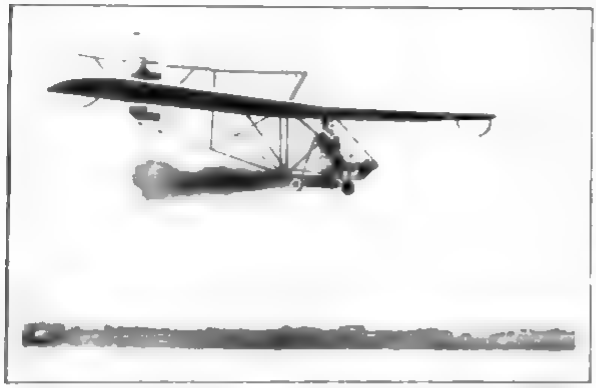
KEEPING pace with the latest automotive developments and with the great improvements in roads, the United States Army is rapidly motorizing many of its artillery units so that they may be moved swiftly to any desired point of concentration. The latest innovation along this line is the new eight-inch howitzer on wheels which has been moved over the highways in excess of fifty miles an hour.

The gun is mounted on a six-wheel trailer and is drawn by a truck.



When the firing position is reached by the motor howitzer the frame is lowered to rest on the ground.

First Rocket Glider Launched Successfully in Actual Tests



William G. Swan is shown at the controls of his rocket glider.

THAT the ground crews hitherto needed for glider flying may soon be dispensed with in many cases was proved recently by William G. Swan, who before a crowd of 2000 persons succeeded in launching a glider by rocket power.

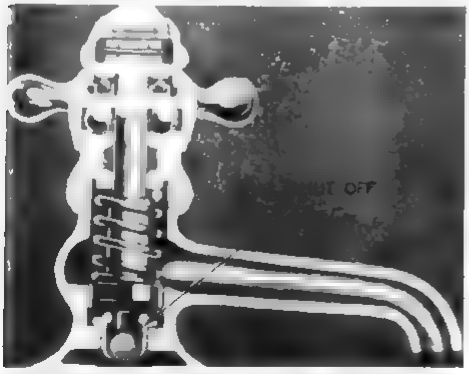
The glider was equipped with two sets of rockets—six to a set—carrying a pushing velocity of fifty pounds each, the ignition apparatus being controlled from the pilot's seat. Despite a strong wind the craft took off at 35 miles an hour and attained a height of 200 feet. No attempt was made at continuous flight, the rockets being used as a launching medium only.

Automatic Ball Shut-off Valve

THIS patented automatic ball shut-off valve may be installed in any faucet, because of its adaptation to modern plumbing fixtures.

A brass housing threaded to screw into the faucet forms the seat, which contains a non-corrosive steel ball. This automatic ball shut-off makes it possible for any house owner to replace a gasket in his hydrant by removing the stem. It is no longer necessary to make a trip to the basement to the main shut-off valve for the building, or do without water in every part of the house while the repair is being made.

The ball, forced up by water pressure, against the watertight seat in the housing, automatically stops the flow of water.



Here's a cutaway view of the automatic ball shut-off valve showing steel ball and the brass pin.

Your Name Stamped on Golf Balls

TWO peas in a pod possess a proverbial similarity, but no more so than four golf balls on the fairway. To save arguments as to whose ball is which, the Globe Tool and Engineering Co., has come forward with a device which makes identification easy.

This golf ball marker may be carried in the pocket.

Metal type bearing your name is set into the bolt head, a little ink is applied, the thumb nut turned and the ball carries your brand for life.

Check up on Your Camera Fittings

IF YOU carry a camera in your car look it over occasionally to see whether any of the small fittings are coming loose. The point of a knife blade or a very small screwdriver will tighten small screws and prevent loss of parts.

Spirals on Revolving Bike Wheel Exercise Weak Eyes

DR. OTTO THOMPSON, an optometrist of Waukegan, Illinois, in exercising and strengthening weakened eyes of patients, makes use of an old bicycle wheel covered with a dark cloth and marked with a spiral yellow line that ends at a colored "flasher." The patient is instructed to look at the yellow line and, as the wheel turns clockwise, his gaze eventually reaches the flasher, whereupon the eye movements start all over again.

The treatment is based on the principle that eye muscles need exercise just like any other muscles of the body if they are to remain strong and one's eyesight is to be at its best.

Weak eyes of patients are strengthened by following revolving spiral on cloth over bike wheel.

Precaution for Would-be Suicides

IF YOU are figuring on committing suicide, be sure to take this precaution: Use new bullets. Old bullets are sure to be laden with germs, so that they might infect the wound, and cause you to die. If you use new bullets, you might recover from the attempted suicide.

Handy Wristholder for Pencil

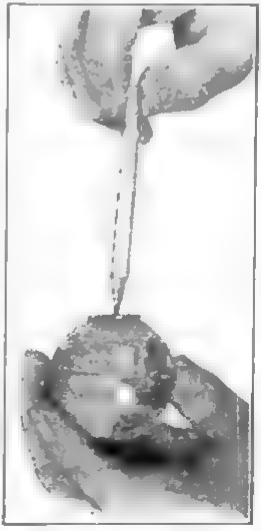
New "Zip" holder which keeps pen, pencil handy.

FOUNTAIN pens and pencils are made quickly and easily accessible by the use of a new wrist pencil and pen holder now on the market.

Pencil Sharpener Like Globe

WHEN it comes to novelty, you'll have to go a long way to beat a new pencil recently placed on the market. Shaped like a globe, it is truly educational, so that you can study your geography while sharpening your pencil. The sharpener is contained on the inside. and the pencil is inserted at the North Pole. The shavings are caught in a receptacle on the inside. which is emptied by separating the two halves of the globe.

All countries of the world are to be found on the map, as well as islands and seas.



The novel pencil sharpener shaped like globe for educational purposes.

Searching the WORLD

From all corners of the globe come the queer animals which modern fashion demands as pets—koa bears, ocelots, even boa constrictors. Read why alligators and raccoons have gone out of style while chimpanzees have become popular.

The koa bear, which hails from Australia, is an increasingly popular pet because of its gentle and affectionate disposition. In appearance it resembles a teddy bear.

Ostriches, reared from eggs laid in this country, have been trained to pull racing buggies at speeds as fast as a horse, but their penchant for kicking makes them unpopular as pets.

TIME was when the dog, cat and canary, with an occasional parrot, satisfied the demands of civilized man for pets, but today not less than half a hundred other animals and birds have been added to the list. Rather more than five and one-half million dollars worth of these strangers were imported by 122 individuals and firms to the United States alone during 1930. And this takes into account only those queer mammal, avian and insect pets imported for sale; not those brought in for their own amusement and entertainmnt by individual Americans.

One of the leading pet dealers of this country estimates that all told more than 5000 persons, outside the United States, are engaged in this suddenly-grown business of catching pets for Americans. Negroes in Africa; Indians in South America, Chinese, Hindus and Malays in Asia; even Eskimos beyond the Circle, devote their days and nights to outwitting the most intelligent of wild animals and birds with snares and traps, so that they may be delivered in good condition to ships at the nearest port for transportation to San Francisco or New York, the two great "pet ports" of the United States.

One woman, recently come into a large estate in California, ordered six *burra* deer from Mexico, five kangaroos from Australia, three red-and-blue lories, from the Antipodes, and seven flamingoes, from Florida. Her order was filled within a month. An-

for QUEER PETS

by H. H. DUNN

other wanted a pair of macaws—large, multi-colored parrots—each of which spoke English, Spanish and French. She got them in six months and they cost her $1,000 each. A man who owns a large fenced acreage of eastern Oregon mountains, sought and obtained—for $20,000—seven snow-white, black-horned mountain goats from the snow-covered ranges of Alaska, so far "domesticated" that they could be approached without stampeding.

One man, and he seems to be unique in his industry in the United States, if not in the world, makes an extensive business of catching and training wild cats native to the United States.

This man, C. J. Ullom, prowls the mountains of the West in the spring, seeking the dens of wild cats. From these he takes the kittens, or cubs, rears them on milk fed through an ordinary nursing bottle, and literally lives among the savage little animals until they have become well accustomed to man's presence, and to look upon him as the source of their food and comfort. He has found it impossible to tame or train a wild cat if it is caught at an age of more than two months.

Rearing Lion Cubs as a Business

Along similar lines, F. V. Hogue, of Texas, rears mountain lion cubs to adult size with the aid of bottles of milk and gentle hands. In addition to his lions, which may be led about with collars and leashes, like dogs, Hogue has produced on demand several jaguars, the leopard-like animals of Mexico and Central and South America.

Possibly the most unusual order ever received by a pet-hunter is for a white elephant, one of the albino pachyderms so valued in Siam and Indo-China. This came from an actress in Hollywood, and has not yet been filled, though Joe Fields, of Bangkok, has written his San Francisco correspondent that the animal will be on its way to the pavements of Hollywood this summer. Aside from elephants, the largest pet on record is a 5,000 pound elephant seal, more commonly known as sea elephant, which, with three others, all smaller, was brought to the San Diego zoological garden. This huge bull, twice the size of any one of his

Left an orphan when his mother was killed, this forlorn-looking little brown bear was bottle-raised by a ranger and is now a full grown specimen.

companions, became tractable almost at once, taking his daily fifteen pounds of fish from the keeper's hand, and permitting the latter to scratch his head and even to get on his back as the two and one-half ton animal lay on the sand pile near the tank.

Snakes have come into great vogue as pets, all the way from the two-foot king snakes and the five-foot gopher snakes, to great sixteen to twenty-foot boas and pythons only slightly smaller. There is a man in Los Angeles who will supply you with a "domesticated snake" on telephone call, of any variety or size you may desire. With each snake he will send instructions as to whether the reptile is to be fed on live white mice and rats, or dead hamburger.

Snakes Are Popular Pets

He has venomous snakes, too, for sale to laboratories and zoological gardens, but his largest trade is the sale of "tame" non-venomous reptiles for pets. He keeps a stock of 75 to 100 large, harmless snakes on hand all the time, and makes at least one trip a year into the tropics to bring out boas and pythons. The boas are in greatest demand as pets, and bring from $100 to $300 each, depending on size and "smartness", which,

Domestication will change even so untamable an animal as this bob-cat (California lynx). Claws are carefully retracted as the wild-cat gently holds the hand that feeds it, taking pains to avoid scratching.

Due to their intelligence and affectionate disposition, chimpanzees are increasingly popular as pets. This is "Maggie," who eats with a knife and fork, uses a napkin, chews gum, and knows tricks.

in snake-collector terminology, means liveliness and activity. Some of his boas are sixteen to eighteen feet long and weigh in the neighborhood of 100 pounds, yet their fair and proud owners—for women most frequently choose snakes for pets—will wear them draped around necks and waists.

"Snakes are just like men and women, some have good dispositions and some bad," says Paxson C. Hayes, the snake-pet man. "But most of the non-poisonous varieties are dependable and intelligent. They are tame from the time they are picked up, and may be made good pets at any age."

Hayes catches his non-poisonous snakes with his bare hands, though one twenty-foot boa cracked three ribs for him with one lightning loop around his body, down in Mexico. That boa is now the pride of the Hayes snake farm. Three men were required to subdue this 110-pound reptile and bring him back to become some American girl's pet.

Few birds are more wild and wary than the herons and similar marsh-loving waders. Yet on Avery Island, in Louisiana, Edward A. McIlhenny has made friends with hundreds of pairs of them, even to the rare white egret of the beautiful plumes, once so valued for decorations on women's hats. More than this, he has saved these egrets from extinc-

2½-Ton Sea Elephant Eats Out of Keeper's Hand, Lets Him Sit on Back

Perhaps the strangest pet in the world is this 5000-pound sea elephant, which takes food from its keeper's hand and even permits him to sit astride its back when out of water.

tion, at the hands of the plume hunters. They make their nests and rear their broods in the trees around the McIlhenny plantation, and are so tame that the visitor may make all the "close-ups" he desires with any small hand camera.

There are fashions in pets, just as there are in gowns and jewelry. Alligators, for example, which five years ago were in wide demand as yard companions for those who wanted the latest, are now almost out of the picture, though there are alligator farms from Los Angeles to Palm Beach, wherever the saurians thrive. Young lions, and even tigers and leopards, no longer find the market they did five years ago. Today, a chimpanzee which can eat with knife and fork, and walk down the street hand-in-hand with its owner, is worth as much as two lions or tigers. The smaller and less-intelligent monkeys, except the delicate little marmosets, can be bought for less than half their cost ten years ago.

Brown and black bears, and especially the tiny gray Koa bears, with their tree-climbing abilities and their gentle dispositions, are in demand, with prospects of a stiffening market, so if you want a good-natured pet, yet one which may startle your friends, invest in a bear. Bears are bottle-reared, also,

Flamingoes, pink-winged and stilt-legged, make unusual pets, living on fish and shrimp from their pool. They are easily tamed and photographed.

Sea-lions, tame as dogs and often as intelligent, can be trained to do all sorts of stunts. This one is selling papers on a street corner.

like little mountain lions and wild cats. Many a full-grown wild bear in the Yosemite Valley owes its life to the ability of a forest ranger to find canned milk and a nursing bottle, for the adult bears will wander from the protection of the park, and, meeting some hunter, fail to return to their cubs.

The United States Marines are noted for "having been everywhere and done everything," but one of them started a new fad in pets by bringing out of the Nicaraguan jungles a tame ocelot. Now, an ocelot is a wild cat, about twice as large as a well-grown house-cat. It is spotted like its larger relative, the jaguar, except that it has even more beautiful markings. It is unlike the wild cat of the United States in that the ocelot has a long tail, and lacks the tiny tufts of hair on the tips of the ears which mark the lynx. Ever since the days of the Maya and Aztec empires, ten to twenty centuries ago, these little spotted cats have been domesticated for the peoples of southern Mexico, Central America and South America.

When the Marine brought his ocelot to the United States, it had become so tame that it could be released, like a domestic cat, around the house and yard, even following its master down the street and through his home town like a well-trained dog. Contrary to the usual habit of the cat tribe, this ocelot loved water. The sound of a running hose or a hissing lawn-sprinkler would send it leaping to play in the spray. The combination of Marine and long-tailed, spotted, gold and black wild cat conquered the pet owners who saw them, and the demand for ocelots is far beyond the supply.

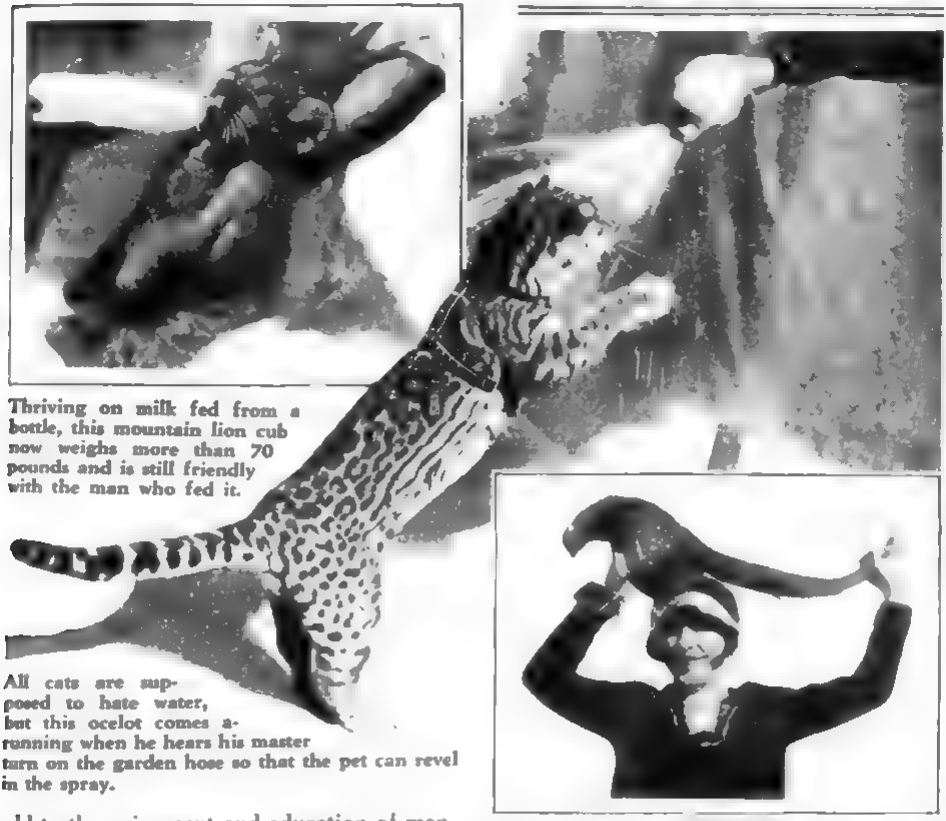
Coyotes Are Untamable

Even wolves have been tamed and trained as pets, but their smaller relative, the coyote of the western plains, remains an Ishmaelite among the four-feet. Occasionally, a Cocopah, a Yuma, a Chimahuevi, or a member of some other western tribe of Indians will tame a coyote, but so far as the writer knows, no white person ever has made a pet of one of these swift-footed, sharp-toothed little marauders, though they are still common in many of the western states.

Of all the pets, fish are the most difficult to maintain. Bert Day, who spends most of his time cruising around the Philippines and the Hawaiian Islands in search of gorgeously-colored and curiously-shaped fish for public and private aquariums, tells me that nearly 40 per cent of the catches, no matter how carefully made, is lost before the fish can be delivered to the tanks wherein they are to

Ocelots From South America Are Latest Pet Fad, Costing About $250

Thriving on milk fed from a bottle, this mountain lion cub now weighs more than 70 pounds and is still friendly with the man who fed it.



All cats are supposed to hate water, but this ocelot comes a-running when he hears his master turn on the garden hose so that the pet can revel in the spray.

A Golden Pheasant is magnificently ornamental. This bird is tamed so that it comes on call.

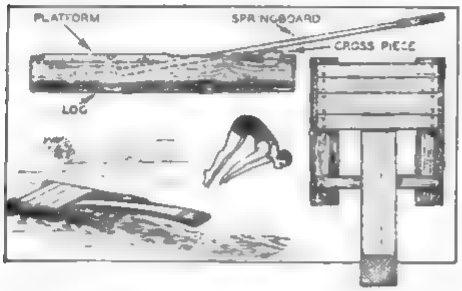
add to the enjoyment and education of man. The Japanese early realized the obstacles to this form of pet-hunting, and established goldfish "farms", where more than one thousand varieties are produced under the same conditions they will encounter when distributed to their future owners. This goldfish farming is an extensive pet-producing industry, worth, it is estimated, more than half a million dollars annually to the goldfish farmers of California alone.

Birds as pets range from ostriches which have been trained to pull light buggies at speeds almost equal to that of a good horse, to tiny multi-colored finches from Asia, and form what is known as the "main stock" of the dealer. Golden eagles have been taken from California to England, in a revival of the ancient sport of falconry, and were so successful that trials were made with duck-hawks, pigeon-hawks, sparrow-hawks and even the rough-legged hawk in this country. All these birds were tamed to a degree and taught to return to the leather-covered hand of their owner at his whistled call. None of them ever equaled the great peregrine falcon used for hawking in the days of chivalry, though the golden eagles still are popular among British sportsmen.

Out of this industry of providing queer pets from all the countries of the world has grown another—that of collecting and preparing suitable foods for all of them. From selected, dried and medicated hay for elephants, white mice and rats for snakes to condensed diets for chimpanzees and shredded shrimp for rainbow-fish, the pet owner now can buy everything for his queer companions except water. Booklets, based on the climate in which the pet-owner lives, instruct him in the housing and general care of mammals, birds, and reptiles, while a Japanese in San Francisco is endeavoring to introduce the singing and fighting crickets of Nippon as pets in the United States.

HANDIKINKS

Handikinks are ingenious little stunts that outdoor men, housewives, workbench fans, motorists, etc., will find extremely helpful. You can save considerable time and effort at your various tasks by looking over these pages carefully.

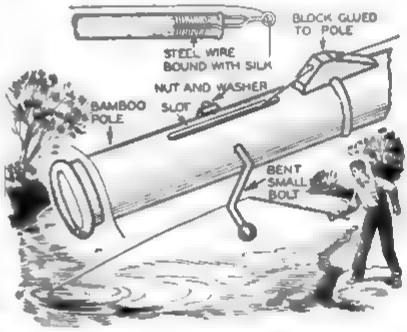


Log Diving Raft for Swimming Hole

YOU can have a great deal more fun at the old swimming hole if you build one of these log diving rafts. Two logs about ten feet long should be selected and joined together by a 2x6 about five feet long at the front and two more such planks on the top to serve as the platform. An eight-foot hickory or ash board thrust between the boards will work nicely as the springboard.—Ted Allen.

Bamboo Fishing Pole With Built-in Reel

A SIMPLE and convenient reel for your bamboo fishing pole may be made by slotting the handle and inserting in a hole bored through it a small bolt bent into the form of a crank, as illustrated in the accompanying sketch. A pair of nuts hold the crank in place, while a small wood bridge bored with a small hole and glued above the slot acts as a guide.—Dale Van Horn.



Vacuum Cups on Heels

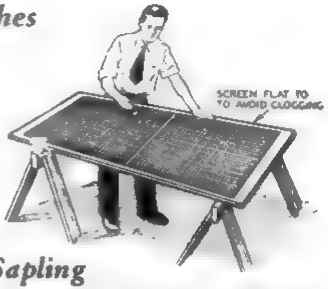
TO KEEP rubber heels from skidding and slipping on wet streets and sidewalks, take a sharp knife and cut a V-shaped trench about one-fourth of an inch deep between the first and second nails in each heel, as shown at the left. In the center of each heel cut out a square in the same manner. This forms a vacuum cup and makes the heels hold firmly on a slippery surface. Care should be taken not to cut the trenches too deep, as this might damage the heel and make the space too large for suction.—Raymond Goforth.

Novel Boys' Pool Table

TWO old card tables joined together will make a dandy boys' pool table on which games as thrilling as those played by professionals can be staged. Place these tables end to end as illustrated at the right and cut six three-inch holes for pockets in the positions indicated. Pockets can be made from canvas sacks attached to the edges of the holes. Finally, cover the tables with a layer of felt and screw strips of sandpapered lathing to the edges for cushions. Old broomsticks whittled down, with a disk of felt glued to the tips, make fine sticks.—Chet Sullivan.

A Page of Ideas for Handymen

Screen Painting Stunt to Prevent Clogging Meshes

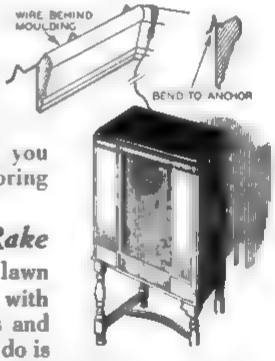


WHEN painting screens you will find that you can do a neater job if you lay them flat on the trestle when applying the brush, and use paint that is half turpentine. This will prevent clogging of the meshes. In addition, use white paint, for this color absorbs heat and affords greater privacy. You can see through it from the inside but not from the outside. Screens so painted are thus very suitable for sleeping porches.—Weston Farmer.

Saw Frame From Hardwood Sapling

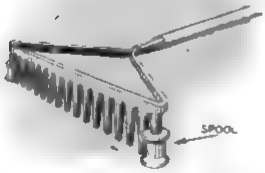
BELIEVE it or not, but a hardwood sapling will make a far more serviceable frame for a buck saw blade than a manufactured frame. The sapling to be used should be bent as shown in the drawing at the left and a hole bored in the end and in the handle. Then slot the sapling at these points and slip the blade into the openings. Two small bolts inserted in the holes will hold the blade in place. You will find that a frame like this does not go to ruin like the ordinary frame, and in case you are going on a hunting trip all you will need to carry is the blade. You can make your own frame on the spot.—John Deniston.

Ceiling Moulding Makes Ideal Nest for Aerial



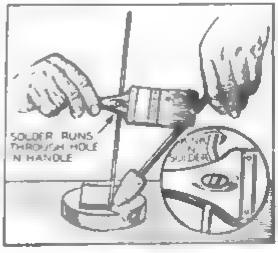
IF YOU have a little radio in your home and are at a loss to know how you are going to string up an indoor aerial for it, you will find that the ceiling moulding makes an ideal support. By arranging the wire as illustrated in the accompanying drawing, bending kinks for anchorage every three feet, you can easily rig up a hundred foot antenna in your living room to bring in distant programs loud and clear.—Bill Duncan.

Spools on Teeth Make Garden Rake Into Lawn Rake



A VERY serviceable improvised lawn rake can be made quickly and with little effort from two wooden spools and an iron garden rake. All you need to do is slip a spool on each end tooth of the rake and you are ready to go. These spools act as guides, preventing the teeth from tearing out roots and damaging the lawn. To use the rake in the garden simply remove the spools.—Eugene Keyarts.

String Solder Holder and Flux Brush in One



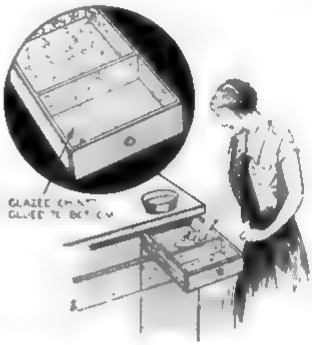
YOU can speed up your soldering jobs a good deal and save yourself a lot of exasperation by constructing this novel little combination flux brush and solder holder. First take the paste brush and bore two holes through the handle as illustrated at the right, a large one through the front and a smaller one through the side. Slip the string solder through the latter hole. Using the device you do not have to lay down the brush when soldering. Simply apply the paste to the object, then place solder in position on the heated iron.—H. Moore.

Labor-Savers for the Household

Hose on Faucet Prevents Damage When Rinsing Glasses

RINSING fragile china or glass tumblers under a water faucet often results in damage to the article from chipping. The best way to avoid such costly accidents is to provide a cushion for the spout of the faucet. A piece of rubber hose about three inches long slipped over the metal will be just the thing here, as it will not chip the glass in case of an accidental blow.—Chester Johnson.

Chintz Drawer Lining

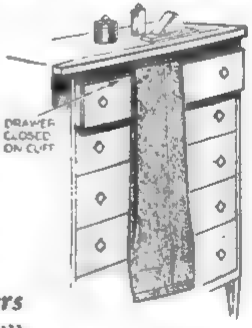


HOUSEWIVES know what a difficult task it is to clean small drawers in dressing tables which have become untidy from spilled talcum powder or other cosmetics. To reduce effort necessary in the cleaning, it is a good idea to tack or glue sheets of glazed chintz on the bottom or sides of the drawer. This provides a smooth glossy surface so that a sponge can be used effectively in wiping up the debris. Incidentally, proper selection of color enhances the appearance of the open drawer.—Mary Sibley.

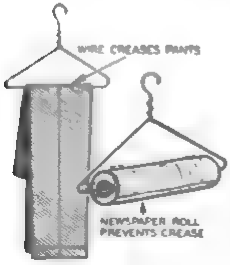
Inner Tube Strip Makes Ironing Easier, Saves Cord

ONE of the most frequent household annoyances is the burning out of the electric iron cord. An excellent stunt to prevent the fraying of the cord is to cut from an old inner tube a strip about a half inch wide and 20 inches long and attach one end of it to the light socket and the other to the cord about a third of the way up. In use, the band holds the cord taut and makes ironing much easier.—Milton Dolby.

Bureau Drawer Presses Pants While You Sleep



HERE is a simple stunt to press your pants at night while you sleep. Before you retire pull out the top drawer of your dresser, then insert the cuffs and close the drawer so that the trousers are pinched tightly. In the morning the trousers will be smooth and neat. A press will last much longer if you take care of your pants in this manner. The scheme removes the unsightly creases and wrinkles that work in during the day, and also serves to dry out all perspiration.—Oscar Mason.

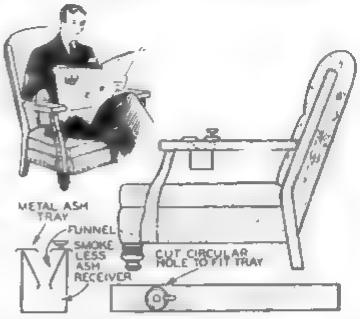


Paper Roll Avoids Kink in Trousers

AN ORDINARY wire clothes hanger will not allow a pair of trousers to be hung from the cross bar without making a highly undesirable crease across the knees. This can be prevented by rolling a newspaper around the crossbar and pinning the ends as illustrated in the accompanying drawing. The larger area of the roll leaves the pants smooth and neat. About six double sheets of newspaper will be required for the roll, which should be wound up tight for rigidity. If no safety pins are available, glue may be used for fastening.—George Holt.

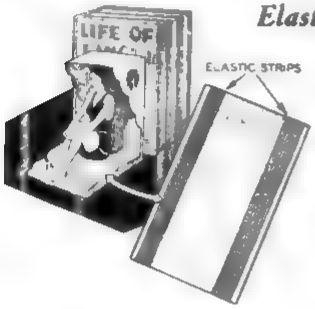
Helpful Kinks for Home Comfort

Built-in Ash Tray for Arm of Easy Chair



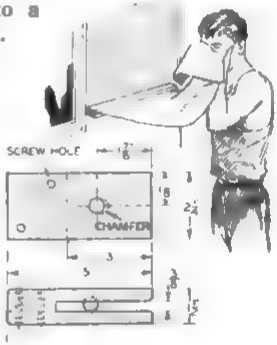
AN ASH TRAY in the arm of your easy chair will prove a great convenience when you have settled down for the evening to read the papers. In building a tray into the arm, first bore a three-inch hole in the wood, then insert in it a metal container with rim bent outward for a support. Into this fit a funnel with the spout removed as illustrated. Finally procure a ten-cent ash tray, cut a hole in the center, and screw it over the funnel and container. The receiver is emptied by removing the tray.—Leo Serr.

Elastic Strips Pad Book Ends to Prevent Table Scars



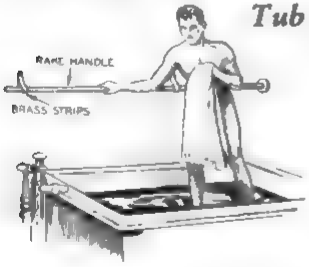
METAL book ends frequently develop a bad habit of marring the polished surface of the table on which they stand, but you can break them of this habit by padding their bottoms with black elastic strips. These strips are cut to length of the bottoms and glued on with a good grade adhesive. Additional strips may be pasted across the ends, or if the book end is narrow the entire bottom may be covered. Sketch at the left shows how the strips are applied to a large book end.—Robert Mann.

Towels Easily Removed From Firm-grip Holder



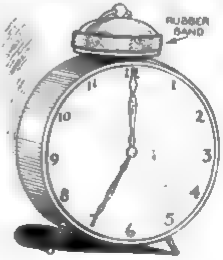
A TOWEL holder that will grip a towel firmly and yet allow it to be removed instantly by merely slipping it out the side can be made from a marble and block of wood. Use any good grade of wood available and cut it to the dimensions given in the drawing at the right. The size of the hole to be bored through the back will depend upon the size of the marble used. When the towel is pulled the marble slips down in the inside chamber and thus grips the cloth tightly. Richard Robinson.

Tub Hand Rail Prevents Falls



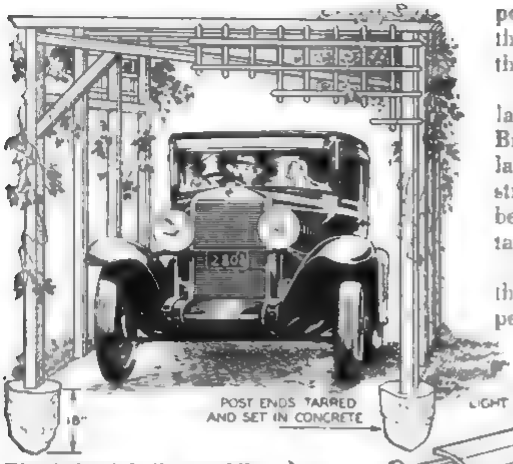
THE danger of injury from slips or falls in the bath tub can be greatly reduced by erecting a handrail alongside the tub, as illustrated at the left. The rail may be made from an ordinary broom handle, which should be supported on the wall by two brackets made from metal strips 11 inches long and three inches wide and bent as shown. These brackets should be screwed into the walls about 18 inches above the tub.—Charles Barr.

Rubber Band Muffler for Alarm Clock Reduces Noise



IN MANY homes alarm clocks become a nuisance on account of awakening others for whom the alarm was not intended. To avoid this slip a rubber band around the bell of the clock as shown at the right. This will so muffle the ring that it will not annoy others outside the room, but will awaken the sleeper for whom it is intended.—G. E. Hendrickson.

Grape Arbor and Car Shelter in One



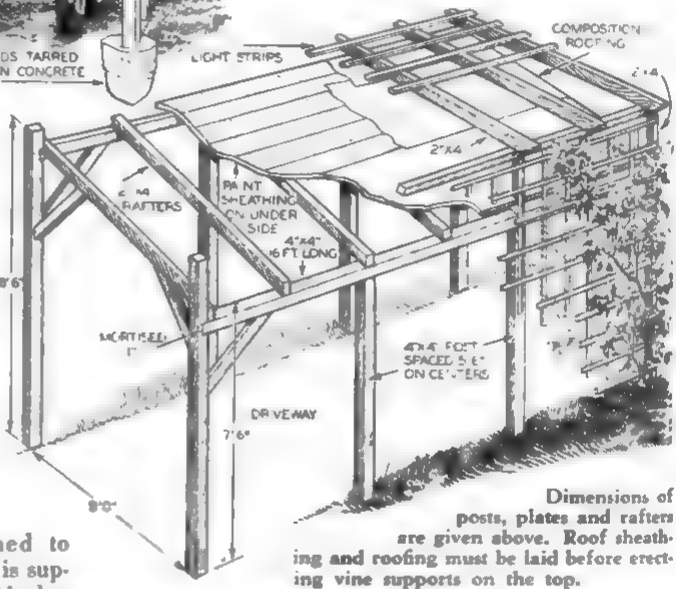
The shelter is built astraddle the driveway as illustrated here, the top and sides being covered with grape vines.

MOTORISTS sometimes find it inconvenient to put the car in the garage every time they enter the premises, and yet they do not like to let the car stand out in the open. Here is a solution to the problem—a combination grape arbor and shelter for short time parking.

The shelter is designed to straddle the driveway and is supported by eight posts set 18 inches in concrete as shown in the accompanying drawing. Dig the post holes five feet, six inches between centers. After planting the posts, install the 4"x4" top plates and then the rafters, mortising the plates one inch into the posts.

The roof sheathing and roofing should be laid before the vine supports are erected. Brace the corner posts as shown and build a lattice over the framework with 1¼"x1" strips. If the arbor is to be painted the lumber should be surfaced. Rough material will take only stain.

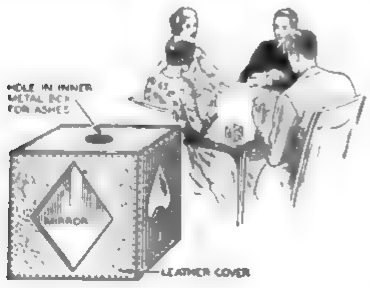
Such an arbor is ideal for grapevines, though other vines such as English ivy, trumpet, woodbine and the like are suitable.



Dimensions of posts, plates and rafters are given above. Roof sheathing and roofing must be laid before erecting vine supports on the top.

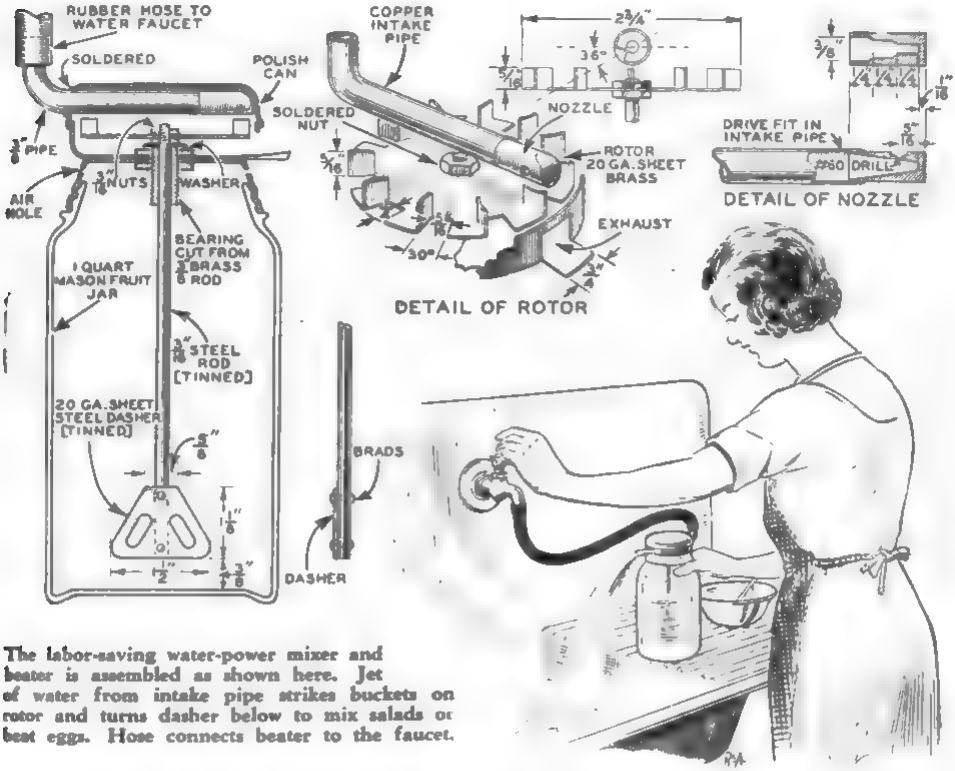
In case the driveway runs close to house, you can use the wall instead of posts on one side.—Hi Sibley.

Ornamental Bridge Table Ash Tray Has Handy Mirrors for the Ladies



HERE'S a little ash tray that will make a fine ornament for your bridge table. It has four mirrors, all shaped like card symbols and is practically non-spillable. First cut five 3" squares of ¼" thick wood and outline the four card suits on the sides, using a coping saw to cut them out. Then, with a chisel cut out a section to take the mirrors, which are cemented in, face outwards. Next construct a zinc container to fit inside the wood box. Finally, cut a hole to receive the stubs and cover the box with attractive leather. The tray may be emptied by removing it from the wood casing.—Jas. Holman.

Water-Power Mixer and Beater



The labor-saving water-power mixer and beater is assembled as shown here. Jet of water from intake pipe strikes buckets on rotor and turns dasher below to mix salads or beat eggs. Hose connects beater to the faucet.

THE use of this water power-driven mixer and beater will result in a great saving of time and energy for the housewife. It will beat eggs, whip cream, mix salad dressing, or stir refreshing drinks, and can be built by anyone possessing a few tools and a little mechanical ability.

The beater consists of a quart glass fruit jar on which is mounted a very compact little water motor that is connected, when in use, to the kitchen water tap by means of a short rubber tube. The outer casing of the motor is made from a "Two-in-One" shoe polish can, with a section cut out of the lower half to provide an exhaust.

To make the rotor, take a piece of 20 gauge sheet brass of the dimensions given above and cut in it twelve blades, bent to the shape shown in the drawing. The finished rotor should be mounted on the threaded end of a 3/16 in. steel rod, and secured by soldering. The lower end of the shaft is fitted with a steel dasher attached by means of rivets.

The rotor shaft is mounted in a long bearing cut from a piece of 3/8 in. round brass rod, which is threaded throughout the entire length and bored to make a running fit for the shaft. This shaft is mounted in the lower half of the casing as illustrated above.

The intake pipe is made from a short length of 3/8 in. copper tubing, and fitted with a nozzle cut from a 3/8 in. solid brass rod. This rod is reamed and counterbored, then reamed to a smooth taper as illustrated above. It should make a drive fit in the enlarged end of intake pipe and soldered for firmness.

In boring the hole for the jet, use a No. 60 drill, then countersink with a 3/16 in. drill. Finally, the intake pipe should be soldered throughout its entire length to the case. Some slight adjustment of the rotor and the pipe may be required to determine the most efficient arrangements.

PLAYING *the World's*

A bunched field entering the stretch on the first lap of a 25-mile dirt track race to open the 1926 season at the Ascot track in California. Lou Moore, winner of the race, and the leading driver on the coast that year, is shown in the lead. At the right is a typical Chevrolet Special racer with Robert M. Roof, its designer, at the wheel.

by **ROBERT M. ROOF**

(Builder of cars for dirt track racing)

It is danger in sport that fascinates both spectator and participant, which is the main reason why dirt track racing is gaining in popularity every year. In this article a man who has devoted his life to the development of this thrilling sport gives you some real inside information on the men and cars that burn up the ovals at the state and county fairs about this time of the year.

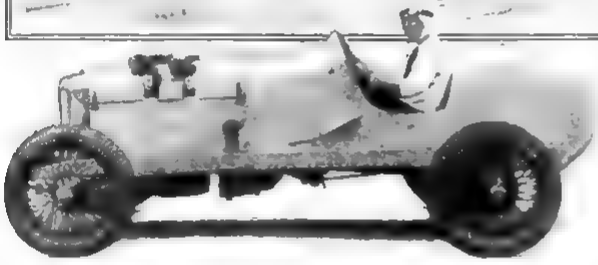
BOB CAREY, a lead foot king of the dirt tracks, put his leaden foot down on the accelerator in a race at Winchester, Ind., last Labor Day and took a little souped-up Chevrolet around a half mile track in 23 2/5 seconds.

On the wall of my shop, where the power parts for that car were built, hangs a faded photograph taken at that same Winchester track in 1922. Thirteen cars—unlucky number—are lined up for the start of a race run just eight years ago. Five of the thirteen drivers are dead today, killed on dirt tracks. Among them is Chance Kinsley, who that day in 1922 drove one of my double overhead cam shaft Fords to victory in every event on the program.

Five out of thirteen dead! The half mile dirt track race game has well earned its title of the world's most dangerous sport.

Yet there are somewhere between 200 and 300 half, five-eighths and mile dirt tracks in the country staging automobile races, and more are being added every year, while

Most Dangerous GAME



Fighting the blaze after Lou Smith's car caught fire at the dirt track at Langhorne, Pa. Smith escaped injuries and the race continued. At the left is shown Al Waters and the Fronty Ford in which he won the 100-mile U. S. dirt track championship at the Hawthorne track at Chicago in 1925. His time was 8:24.2.

orders for cars and parts are coming from all over the world.

From its initial stronghold—northern and central Indiana, western Ohio, eastern Illinois and southern Michigan—the lure of the dirt track racer is spreading wherever fast automobiles are loved.

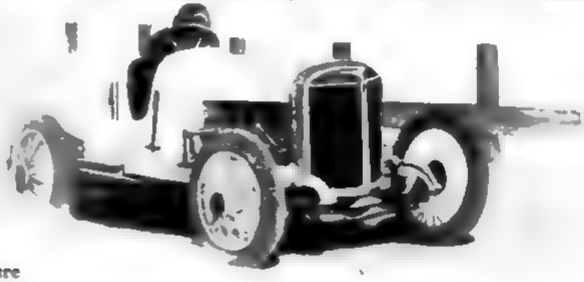
The Frank Lockharts and the Billy Arnolds of the brick and board speedways came up from the dirt tracks. The boy that can drive a souped-up Ford or Chevrolet to victory on the half mile ovals can drive anywhere.

Yet dirt track racing is a thing apart, totally unlike racing on the Indianapolis speedway, or the big bowl at Altoona. Cars that can stand the grueling grind of 500 miles on the two and a half mile brick track at Indianapolis can't begin to compete with some backyard garage built Ford or Chevy even on a mile dirt track at speeds of under 90 miles an hour. Sounds funny, doesn't it? Yet only last year two of Fred Duesenberg's fine big speedway racers were taken over to the mile state fair grounds track at Indianapolis and on their time trials couldn't get better position than second row, while our little rebuilt pleasure cars were in the front line.

The answer is the trick of racing on the small ovals. The driver who eases up on his gas pedal at the turn is out, and may be dead. The speed kings of the dirt ovals throw their cars around the banked turns in a skid and then give the motor more gas and depend on the power in the rear wheels to pull them out. Front wheel drive is no good on the small tracks—too light in the rear end. Four wheel brakes also are out, and a lot of the boys don't use any brakes, for usually if you get in trouble there isn't time nor place to use them. It's easier to pull in your head, trust to luck, and let her roll. We've had cars somersault two or three times without damaging the driver.

Some 200 boys are racing on the dirt. Most of them break in at around 20 to 25. Older men, whose reflexes and reactions have begun to slow down, make poor beginners. Specially good drivers who get in early

Eating the dust! The dirt track kings fighting it out on the Ascot Park Speedway at Los Angeles in a spectacular race.



Bill Marvel making a turn in the 10-mile feature at Staten Island Fair Grounds.

enough may last 15 or 20 years. Ira Hall is around 40 years old and has been in the game for 15 years. Dutch Bowman was about the same age and had about as many years of racing behind him when he was killed at Kankakee, Ill., last fall. Most of the new boys are garage mechanics who hang around and make themselves useful until someone offers to risk a $3,000 car on their ability to drive it. It's the lure of the speed and danger that brings most of them in, and keeps them racing for years. Financially, the rewards are far from in keeping with the risks. Three or four thousand dollars a year is a good income. But a lot of the boys would drive for nothing if they couldn't get a mount on any other terms.

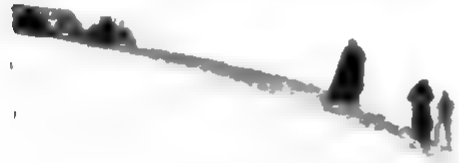
The risks are not only big and the pay small, but the work is hard. The average life of a motor between overhauls is 40 miles. Imagine tearing down an engine and rebuilding it every week, in order to compete in two or three 5-mile and one 20-mile race Sunday!

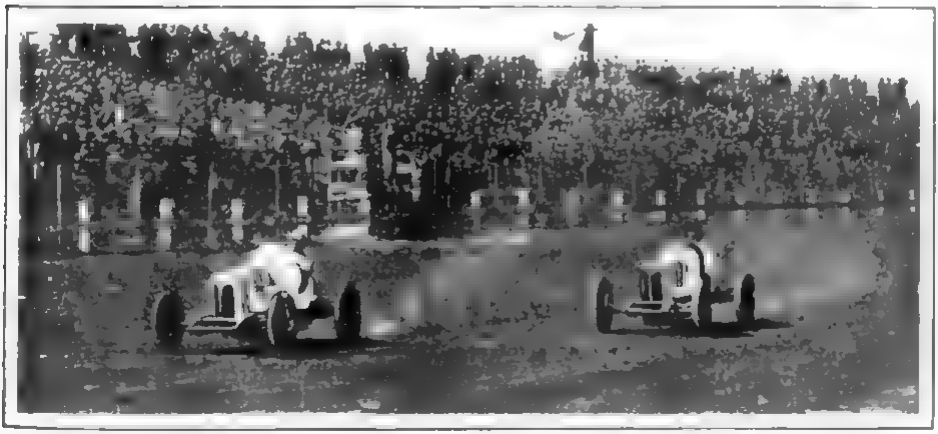
The speeds have been getting so high and the life of the engine between overhauls so correspondingly short that we may have to give up the rebuilt pleasure car engines altogether and use special racing jobs. In fact I've just turned out a marine type, four cylinder engine, that develops 175 horse power at 5,000 r.p.m., as compared to around 90 h.p. from a souped-up Chevy or Ford at around 5500 r.p.m. With the more powerful racing engine we will be able to turn them over at around 4000 r.p.m., prolonging their life considerably, and still have plenty of power. And the marine type, dry sump job, makes frequent overhauls almost a pleasure. Inspection plates on either side of the crankcase give quick access to the connecting rods and shaft, and—a real novelty—I've cast individual cylinders in square units, which are drawn together by bolts, with gaskets between the pairs, to form a block with a continuous water jacket. Yet I can take it down and have all four individual cylinders on the

bench within an hour. The separate cylinder idea eliminates complicated coring in casting the cylinders and jackets, makes it easy to clean out the casting "fins" with a file, and if one cylinder goes bad it can be replaced, instead of buying a whole block. The economies in manufacture are so great that we will be able to sell the complete motor for about the price of a second hand Ford or Chevy engine plus the conversion parts needed to turn it into a race car motor.

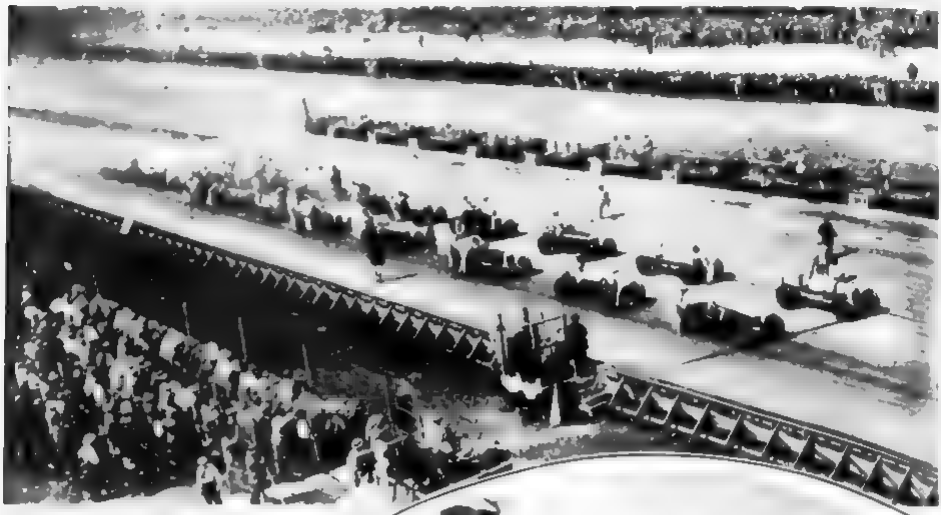
The thing that makes dirt track racing so dangerous, that wears out engines so fast, and makes it impossible for the big race cars to compete in the game, is the constant acceleration and deceleration on the short stretches and turns. For the same reason supercharged engines can not be used, as a supercharged job will not build up power fast enough on the short stretches.

While the big speedway cars are using a compression ratio of not more than 8½ to 1 we are using up to 11 to 1 on the dirt tracks. The things that have been done with special power heads and other parts applied to the old Ford and Chevy fours are amazing. Bureau of Standards tests of the Ford Model T showed around 13 to 14 h.p. We get 90 h.p. out of the same engine. In the old days race drivers thought they had to have high gear ratios to get high speed. Now we know we need just the opposite. You couldn't get the horse power out of an engine with high gears. Nowadays we get a high motor speed and then transmit the power with a lower ratio. It's largely that high motor speed that enabled us to get 90 h. p. out of the old Model T motor—and the high speed, of course, required overhead camshafts and valves, power heads, special steel in the timing gears and other parts, full skirted nickel-aluminum alloy pistons, and special fly wheels which

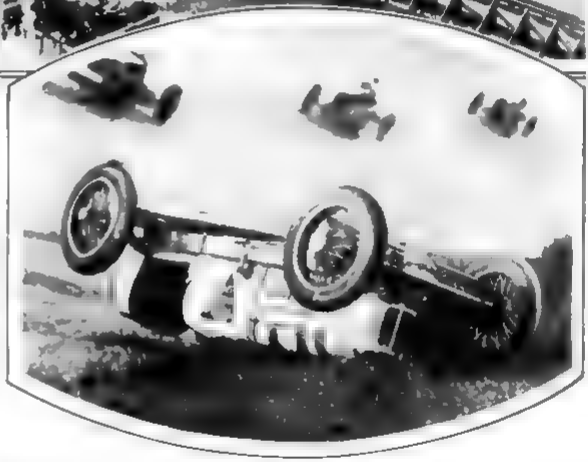




At the top is shown Glen Schultz burning up the road while leading the pack to the top of the 12-mile highway to the summit of Pikes Peak. This spectacular event is held each year on Labor Day. Below is shown Bill Cummings taking the lead in the championship 100 mile race at Langhorne, Pa.



A general view of the start of a 200-mile race at Salem, N. H. This event was won by Earl Cooper, with Hill second and De Paolo third.



Fred Comer was killed in 1928 when his car blew a tire going into the north turn of the Rockingham track. The race goes on.

wouldn't burst at speeds of 5000 r.p.m. or better. In souping-up the Chevy engine we used to take a 72-pound block of specially forged steel and machine out of it a fly wheel weighing 12½ pounds. Now we use Lynite and get the same results from a 7½ pound fly wheel.

Split skirt pistons are never used for racing. Fuel mixtures are very important, and vary with every compression ratio used. The fuel is usually ethyl gasoline and benzoil in the proportions—for an 8½ to 1 compression ratio, of two gallons of benzoil to five of ethyl gas. If we can get pure ethyl to add to gasoline, and so increase the ethyl percentage, we can eliminate the benzoil, but the mixture has to be carefully prepared, for too much ethyl is just as bad as not enough.

Lots of people have the idea, a hold over from a dozen years or so ago, that dirt track racing is a hippodrome game, with a lot of cars owned by one promoter and every race fixed to let a certain driver win. Nothing is farther from the truth. The promoters quit the game because the public lost interest in fixed races. Nowadays every driver is on his own, either trying to win for himself or the owner of the car, but it is rare to have more than one car owned by a single individual in any race. The dirt track game differs from the big speedways, however, in one important point. The track owners usually give a guarantee to get the car owner to bring his machine to the track, the guarantee being in addition to the purses, and protecting the owner against a complete loss in event mechanical trouble keeps him from placing in any race. The guarantee may range from $100 for an especially speedy car with a noted driver, down to $10 for a "jallopy."

Jallopies, in the argot of the dirt tracks, are poorly built cars. Not exactly junk, for any car that can get around the dirt ovals at

(Continued on page 204)

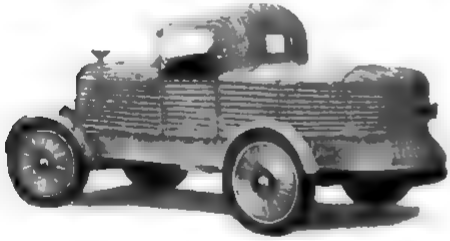
Golf is Now Played Like Roulette

A SCRAMBLING of the ancient Scotch game of golf and the somewhat less Scotch game of roulette has resulted in the creation which beats all for novelty—golf played on a roulette wheel. In the center of a circular pit a gaming wheel, marked like the table variety, spins merrily, while the golfer attempts to knock a golf ball into the winning compartments.

Introduced recently in Los Angeles, the new game is winning increasing favor among West Coast golf fans seeking the thrills of both roulette and golf. The putting tee is located in a recess in the side of the pit, and the ball, shot from there, flutters around the wheel and finally settles into some compartment. Located out of doors to give full health benefits, the wheel is cleverly decorated with flashing lights and illuminated numbers for night playing.

The latest in mergers—a combination of golf and roulette. The player knocks golf ball into compartments of gaming wheel.

Straw Hat Autos for Hot Climes



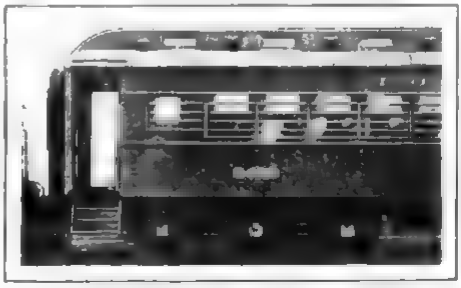
For protection against torrid rays of sun, motorists of Madeira Islands have encased autos in woven straw as shown in the photo above.

IN THE torrid Madeira Islands, automobiles have donned straw hats to provide the last word in comfort for motorists. Experimenters there have found that woven straw is much less heat absorbing than the customary metal cover, and so have equipped their cars with an overall sheathing of this airy material. Hood, body, running boards, mud guards, and even wheels are encased with woven straw and motorists report that they no longer suffer from the terrific heat when their cars are exposed to sun rays. An auto which has gone straw hat is shown in the photo above.

Gov't Builds Hoosegow on Wheels

DID you ever hear of a hoosegow on wheels? Well, the government has recently rigged one up for the transportation of prisoners to the state penitentiaries. From the outside it looks no different from a regular passenger coach, but you may be assured that the bars on the windows are quite adequate to frustrate the most violent attempts at jail break. The interior is so arranged that a formidable army of guards is no longer necessary, four instead of the usual twenty being sufficient to prevent escapes.

Separate compartments provide accommodations for both male and female prisoners, totalling more than a hundred.

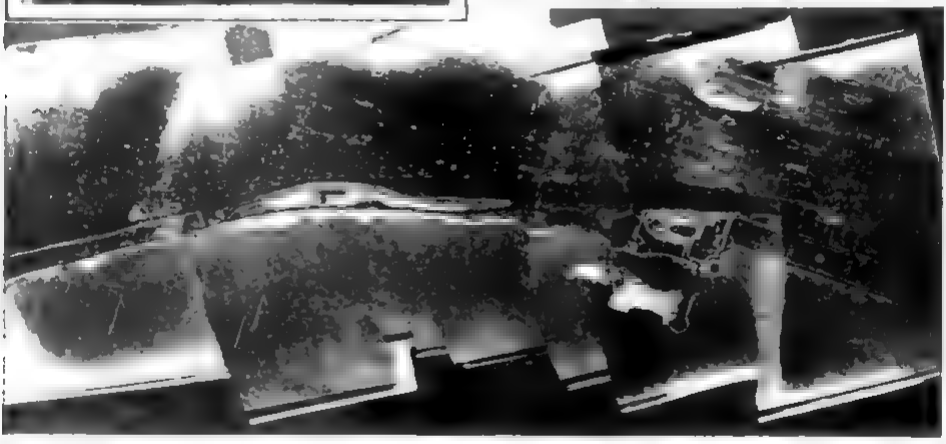


The new government hoosegow on wheels, built for transportation of convicts. Steel compartments and bars over window make escape impossible.

Photo Plane Makes Complete Mosaic Map While in Air

A NEW era in military observation photography was opened recently when a plane flew over the Chicago shore line, made ten snapshots, developed, printed and assembled the photos into a panoramic view before landing, the whole process occupying less than thirty minutes. The plane from which the exposures were made was a veritable flying photographic laboratory, being equipped with specially devised drying, developing and fixing tanks to speed up the various processes. The completed mosaic map, which was handed to Major General Parker immediately when the plane landed, brought out all the features of the lake shore area with the utmost clarity.

With this new development, aerial photography advances to a more important place as an instrument of warfare. Mosaic maps made while in flight may be transmitted instantaneously by television to field headquarters, giving officers a view of enemy.



Top—Corp. K. F. Nourse, developing photos in airplane to make this map of Chicago shoreline.

Seaboard Weather Conditions Make Airship Landings, Take-offs Unsafe

AIRPORTS cannot be seaports for traffic carried in lighter-than-air ships and other large aircraft. Good air conditions for landing and departure of large aircraft cannot be found close to the sea. Water is one of the best substances known for the storage of heat, so that the ocean is likely to be warmer than the land in summer and cooler than the land in winter.

Other complexities are introduced by ocean currents, bringing warm water from more southern latitudes like the Gulf Stream or cold water from northern ones like the Labrador Current. Accordingly air conditions for fifty miles or so both ways from a coast line are likely to be disturbed. This produces dangerous squalls and other circumstances which make it difficult to land or to take off in large airships.

To obtain best conditions for landing fields it will be necessary to locate fields at least 100 miles inland.

PLANE TALK

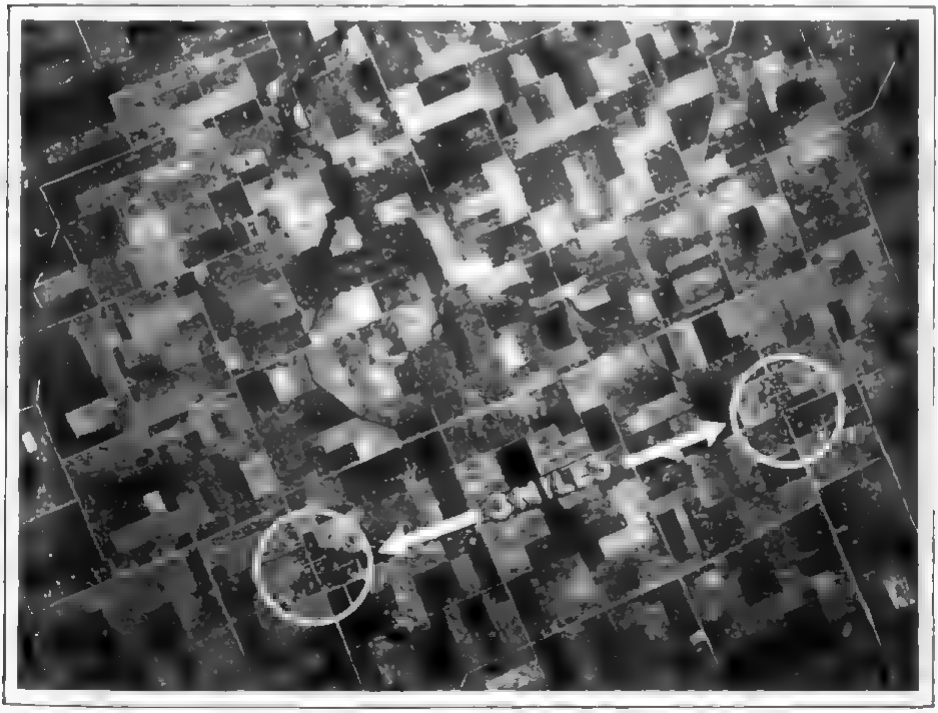
Edited by H. H. ARNOLD

How High Does an Airplane Fly?

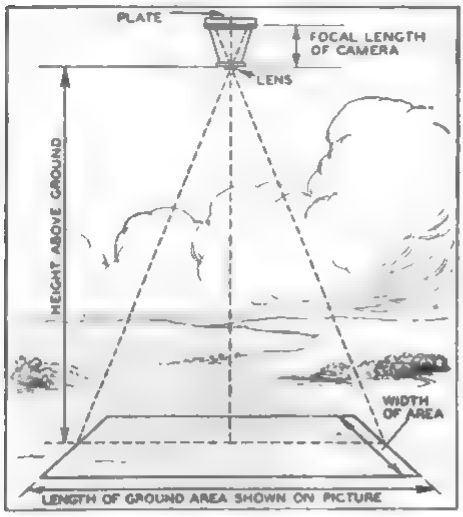
THE average person would think the question, "How high does a plane fly?" rather silly. It is so simple to look at the altimeter and read the altitude when flying in a plane. It is a common belief that the altimeter is correct within a range of twenty to fifty feet. However, suppose that someone should make the statement that there is an error of as much as 1300 feet in altimeter and barograph readings. It looks impossible but there are good reasons for believing that such is the case.

For years the altimeter and the barograph, a recording altimeter, have been considered as being reasonably accurate. For ordinary use the error was not considered at all. For the higher altitudes, there were several corrections made for humidity, temperature and the inherent error in the instrument itself. Thus when a pilot starts after an altitude record and comes down with an indicated altitude of say, 40,000 feet having been reached, it is quite common to have the accepted height attained reduced to some 37,000 feet after the corrections are made. In the past the corrected altitude thus obtained has been accepted without question.

Altimeters and barographs operate on the principle in which the altitude is indicated after the pressure has been measured. In



The photo taken by Captain Stevens, U. S. Army, during a high altitude flight, which seems to indicate that the existing methods of computing altitude are far from accurate. Note the size of the villages which were used as a basis for the computations. The photo was taken from a height of 7½ miles.



Note the similar triangles formed within and without the camera while taking a photo. It is this condition which makes it possible to determine the scale of photos, distances on photos or on the ground, height of the camera above the ground, and the dimensions of the area shown in the photo.

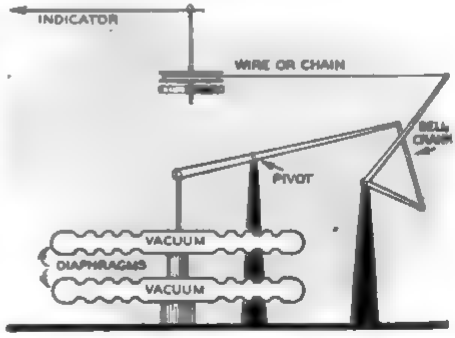
order for any such instrument to be correct the pressure at all altitudes up to the absolute ceiling of aircraft must be known. This pressure has been accurately measured at various points on the earth's surface from the lowest in Death Valley to the highest on the mountain peaks in the Alps and the Himalayas. Thus as long as aircraft did not climb too high, the instruments could be made fairly accurate but as soon as they attained altitudes above the highest observation points, the pressure of the air had to be estimated.

For quite some time there was no reason to doubt the accuracy of these estimations but quite recently the whole theory of measuring altitudes in aircraft has received a healthy jolt. Captain Stevens and Captain Streett took a plane and climbed to its ceiling. However, while up at the extreme altitude they took a picture. When they landed, the barograph was sent into Washington for calibration. While the calibration was being effected, Stevens spent his time developing the film of the picture.

After all corrections were made in the barograph, it was announced that the two airmen had reached an altitude of 37,854 feet. That was quite some altitude for two men to reach in a plane. The thermometer showed that the temperature there was down below 60 degrees below zero Fahrenheit. Ordinarily the announcement of the corrected reading would have ended the matter but not in this case.

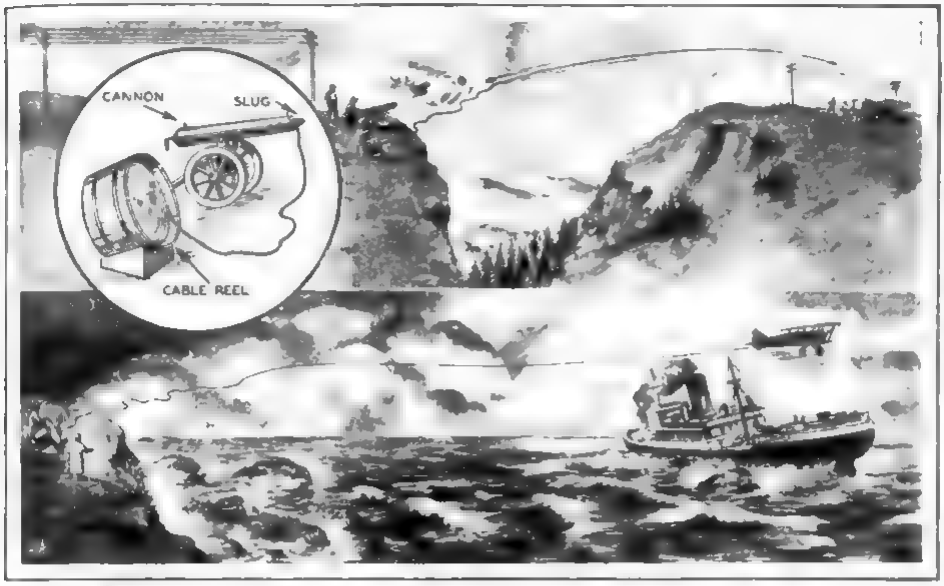
When the picture was printed, Stevens saw that it contained two points the distance between which was very accurately known. He measured the distance on the photo and then by a simple mathematic calculation determined how high the plane was. From the drawing it is seen that the triangle formed in the camera is similar to the one formed by the rays extending to the ground. Thus the distance of the film has the same ratio to the distance on the ground as the focal length of the camera has to the height above the ground.

Stevens, as a result of his computations, gave the figure of 39,150 feet as the altitude reached. There is quite a difference between the two figures, in fact some 1300 feet. Thus the element of doubt is brought into the method of computing altitudes reached by aircraft. From heights of 20,000 feet upward there is a considerable amount of estimation or assumption made when altimeters and barographs are used. With the camera the results are obtained in accordance with fundamental principles. Is it not possible then that we have for years been giving incorrect altitudes that aircraft have attained—quite unknowingly but incorrect just the same?



This figure shows the mechanism of an altimeter with its complicated means of amplifying the minute motions of the diaphragms so they may be measured by the indicator. The two diaphragms have been exhausted of air. Changes of pressure cause the point to move upward and downward. The motion is transferred through the pivot to the bell crank. This causes the wire to pull on the spring upon which is mounted the indicator.

Airplanes May Replace Cannon in Laying Telegraph Wire



At the top is shown how a cannon is used to lay telegraph wires across impassable barriers such as deep ravines and heavily wooded areas. The inset shows how the wire from the cable reel is attached to the slug which is fired from the cannon. This same principle has been used by airplanes for carrying cables as shown, from a point on shore to a ship stranded in shallow water. Once the cable connection has been made, larger cables are attached and passengers rescued with a breeches buoy.

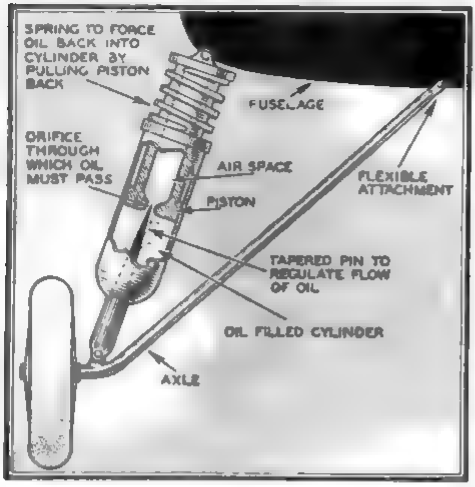
CANNON have been used for many years to send a line or rope across an impassable barrier. Harpoons with ropes attached are shot into whales. The Life Saving Stations use cannon to send lines from shore to ships stranded in low water. However, in both of these cases the distance to the target has always been comparatively short and thus the effectiveness of the cannon for this purpose has been limited.

A few years ago there came an occasion when a ship was stranded in low water but too far out for the cannon line to reach it for the establishment of a breeches buoy. A plane was called into service to carry, if possible, a line from shore to ship. There was much doubt expressed as to whether or not it could be done. However, everything functioned perfectly and the plane dropped one end of its line on the beach and carried the other end out to the ship caught on the reef.

Quite recently the cannon has been used for quite a different purpose. In certain heavily timbered areas it has been found to be almost impossible to lay telegraph and telephone wires. Out in California one of the power companies conceived the idea of using a small cannon to carry the wire across impassable areas. A slug about a foot long was constructed so that the rope could be attached to one end. This slug fitted snugly into the cannon. The rope was coiled and placed in a container. Great care was exercised so that the rope would not tangle when it started uncoiling with its tremendous speed as the slug shot through the air. The opening in the container was directed toward the target.

The gun was aimed so that the slug dropped within a few feet of its target. In this way a wire or cable was laid in a few minutes as compared to many hours with the old method of man power. Now that the cannon has proved itself capable along this line of work it is not too much to expect that the airplane will be called upon to help carry the load. The airplane can lay its cable over absolutely impassable areas and across inaccessible points. Mountains, timbered areas, rivers and deserts are all the same to the airplane dropping its wire so that when the ground crew strings the wire to the poles the job is completed.

Breaking an Eight-Ton Landing Shock With a Thread



This drawing shows the construction of one of the various types of airplane shock absorbers.

THE average airplane weighs somewhere between 1500 and 16,000 pounds when fully loaded. The entire weight of all planes must be borne by the wheels and landing gear when landings are made and when a plane is pancaked, the load imposed upon the shock absorbing devices may even be doubled. Thus the shock absorbers can not be selected by chance.

Airplanes have gone through a cycle of steel springs, rubber cylinders, rubber cord, rubber discs, compressed air, oil cushions and oil cushions with steel springs in their shock absorbing devices. Most airplanes now have but two wheels so that each wheel in the heavier planes carries a load of as much as 8,000 pounds. Consequently the most efficient shock devices are used. At present these seem to be a plunger compressing a cylinder of oil.

Obviously if there is no outlet for the oil, in time it would reach its limit of compression and then something must give way. The result would be a broken landing gear. To obviate such happenings, the plungers have small openings through which the oil passes and it is that thread of oil which supports the plane during landings. The larger the opening the more rapid the oil passes through and the more gradual the cushioning effect but also the longer piston required. A steel spring raises the plunger and permits the oil to return to cylinder after the shock is absorbed.

British Army Rationed From Air

NEW developments in the feeding of troops who must move rapidly over difficult territory are promised, since the successful rationing by airplane of a British column on its 150 mile trek from Peshawar to Chitral this year, when 56 parachute loads of 120 lbs. each dropped at each night's camp site.

British Airplane Has Differential Elevators and Expanding Rudder

AN EXCELLENT example of wasted effort and money in an attempt to secure safety is shown in the Navarro Chief, a freak airplane which recently made its appearance in England.

According to the inventor, an expanding elevator positively prevents nose-diving; differentially-controlled tail elevators insure safety from spinning, while upturned wing-tips positively prevent side-slips.

As C. G. Grey so aptly points out in *The Aeroplane*, "If the claims were literally substantiated in every respect the pilot would not be able to control the machine."

A rear view of the tail assembly of the Navarro Chief, showing the expanding rudder which is supposed to prevent nose dives without diminishing the speed of the plane nor creating drag. The differentially-controlled elevators were designed to prevent tail-spinning, while the wing tips prevent side-slip.

Big Fish Caught by Electrocution

When a fish strikes at the line it pulls contacts on tip of pole together, thus closing circuit and getting a death-dealing jolt of electricity.

A CLEVER California fisherman, Capt. Guy Silva, has perfected a novel and efficient method of landing 200 and 300 pound fish with the minimum amount of labor.

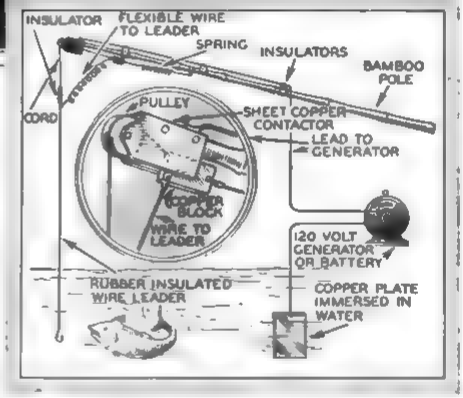
He electrocutes them!

Although the method devised by Captain Silva took him several years to perfect, the device is comparatively simple and can easily be made by anyone.

The accompanying sketch shows the construction of the device and illustrates how the big fish are electrocuted. Voltage needed is 120 volts DC, taken off either a generator or a battery. The generator must be 3 K.W. capacity, as it takes at least 30 amperes 50 seconds to kill a big tuna, though ordinarily they are only stunned when brought to gaff.

The 14 foot pole is of ordinary bamboo about two inches through at the butt end, with a metal contactor on the tip end connected by cable to the positive side of the 120 volt system. This cable should be insulated, as shown in the accompanying drawing.

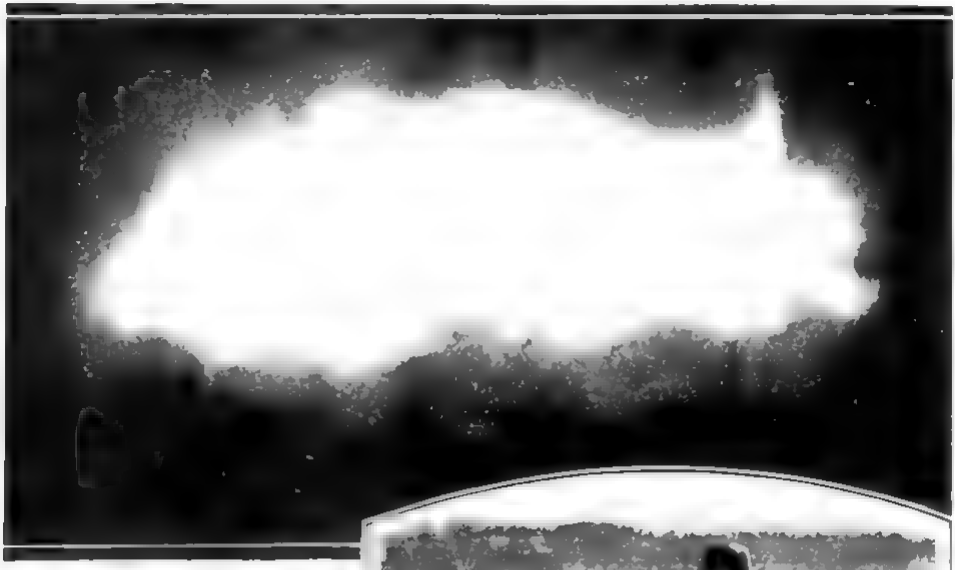
The negative side of the system is grounded in the water through a copper plate suspended by a wire from the boat.



Line and pole to electrocute fish are wired up as illustrated here. One wire from generator goes to contactor, other to the copper plate in water.

When a fish takes the bait on the hook, he pulls the copper block into the copper contactor, thus making the contact and closing the circuit completely. This administers 120 volts to the tuna or other big game fish and kills or stuns it instantly. Thus the fish actually kills himself by closing the switch on the tip of the pole when it gobbles the hook. The largest fish which Capt. Silva has hooked, electrocuted and landed by this method is a 500 lb. shark, which gave up without a struggle.

GETTING a LINE on



Above photo, taken at Tromso, Norway, shows spectacular display of auroral beams flashing across the sky.

Prof. Stormer, eminent scientist and student of aurora, making photo of northern lights at the Tromso experimental station.

ON A clear, moonless night a diffuse glow or a well-defined arch of pale pearly light is seen low over the northern horizon. Gradually the light grows brighter and presently long beams shoot up in great fan-like sheaves. In ghostly procession they shift back and forth across the sky. At times they shake with a tremulous motion, and again rapid flashes or pulsations of light roll up toward the zenith. Such is a typical display of the aurora, or northern lights, as beheld from middle latitudes of the north temperate zone.

These weird exhibitions of nature's fireworks have been the subject of many superstitious beliefs. The Norsemen fancied them to be the Valkyries, in flashing armor, riding through the night. The rare displays seen in low latitudes inspired the tales of phantom armies warring in the sky that abound in ancient and mediaeval chronicles.

What is the aurora? And where is it? Let us answer the second of these questions first.

It is common to think of an auroral display as a local event—like a thunderstorm, for example, and to regard the displays seen at different places on any one night as separate and distinct "auroras." This conception is erroneous. If we could view the earth from some point several hundred miles out in space, we should see that the aurora forms two semi-permanent belts encircling the polar regions of both hemispheres. That of the northern hemisphere is the aurora borealis, and that of the southern, the aurora australis.

Brilliant and widespread displays of aurora occur chiefly at times when the sun is in a state of great turmoil, as shown by the pres-

the AURORA

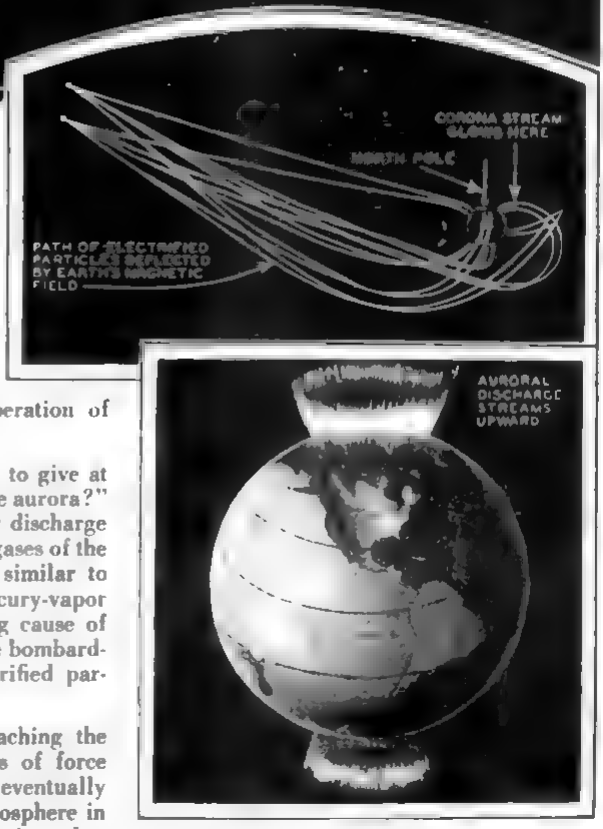
by CALVIN FRAZER

In this display of northern lights, gigantic electrical discharges of corona roll up towards the zenith in ghostly multicolored streamers, accompanied by crackling sounds.

ence of many sunspots and great "prominences" of incandescent gas shot out from the solar atmosphere. These displays are also accompanied by so-called magnetic storms on earth, and interfere with the operation of telegraph lines and radio.

The best answer science is able to give at present to the question "What is the aurora?" is that this phenomenon is a glow discharge of electricity through the rarefied gases of the upper atmosphere, more or less similar to the glows seen in neon tubes, mercury-vapor lamps and the like. The exciting cause of the discharge is supposed to be the bombardment of the atmosphere by electrified particles from the sun.

The solar particles, on approaching the earth, follow the magnetic "lines of force surrounding the earth" which eventually bring them down through the atmosphere in two belts surrounding the magnetic poles. These are the auroral belts.



Top drawing shows path of electrified particles from sun to earth. Below—Corona glow around poles.

The HEATH "Super-

Here is the final installment of that masterpiece of the late Ed Heath—the only type of glider to ever perform a loop. This is a two-place biplane glider of the soaring type and is the next logical step for those advanced Double M fans who have constructed the Northrup Primary and the M. M. Secondary Gliders. The "Super-Soarer" uses the Heath Parasol plans as a basis for construction.

by STEWART ROUSE

PART II

LAST month you were told what changes were necessary in the Heath "Super-Parasol" plans, to convert this job into a soaring biplane glider. The first installment started you well along on your work, so this month we will start with the control assembly, winding up the job before we get through.

The only changes necessary in the control stick assembly are to install a torque tube long enough to put the aileron cable horn to the rear of point F, Fig. 4, to mount the rear torque tube bearing in front of this aileron horn, and to mount the torque tube underneath the horizontal bottom struts instead of above them. It may be necessary to change the length of the rudder bar tripod legs somewhat.

Fig. 9 shows how the tow cable coupling is made and installed on the stem piece. Make the stem piece of $\frac{5}{8}$"x20 ga. seamless steel tubing with a liberal reinforcement of the next smaller size tube slipped inside. The 1/16" flexible release cable passes through a guide at the top of the stem piece and thence back through a hole in the 3/16" 3-ply plywood instrument board at a point just below the altimeter where it terminates in a 2" steel pull ring. Make this coupling as neatly as possible for it must work smoothly and release the tow cable end ring when the cable is under tension. The hook for holding the shock cord for hand launching is clearly shown in Fig. 9 A. Cut it out of 3/16" cold rolled sheet steel and clamp it to the left longeron at the lower end of stem piece.

The side fairing of the fuselage consists of two $\frac{1}{4}$"x$\frac{1}{2}$" spruce stringers on each side running the full length of the fuselage and fastened to each vertical strut with a serving of linen rib cord passed through a 3/16" hole bored through the stringer. These cord wrappings must be saturated with wing

SOARER" GLIDER

dope. Bottom fairing is applied in a similar manner.

The turtle back fairing of the fuselage top consists of semi-circular bulkheads of 3/16" 3-ply plywood, with 3/16"x5/8" spruce stringers set in deep notches around their edges. The instrument board serves as a bulkhead for the little fairing in front of the pilot and its stringers are of 1/4"x1/2" spruce. All wood joints are made secure with aircraft glue and 21 ga. nails of various lengths. The little 20 ga. aluminum stub cowl that forms the front edge of the cockpit has the edge toward the pilot turned over a piece of 1/8" wire, similar to the edge of a bucket rim to give a rounded edge.

Fig. 5 describes, perhaps better than words can tell, just how the wing beam fittings are built into the fuselage structure. The front fitting presents no difficulty, the wing end fitting merely being bolted at the bottom to the fuselage fitting marked H and its top lugs wrapped around its vertical strut, and bolted to the flattened end of the new horizontal compression strut which, with the old horizontal fuselage bottom strut, takes all the compression between the front wing beams.

As the rear wing beam fittings come at unsupported points on the longerons, a new horizontal fuselage bottom strut, and two bays of No. 12 hard aircraft wire bracing must be installed together with two struts J 2 and L 2, which complete the truss. Another horizontal 5/8"x20" strut must be installed between the tops of these rear beam fittings.

These lower wing beam fittings must be so installed that the bottom of the wing at the rear wing beam is 1 1/8" below the bottom of the wing at the front beam, with the ship in flying position, to maintain the correct angle of incidence.

Figures 4 and 6 should serve as guides in constructing the glider tail to replace the regular "Parasol" tail, the details of which are shown in Fig. 6. These details are all right excepting that the glider tail has longer spars and ribs due to its larger size. Follow the overall sizes given in Fig. 4 and use Fig. 6, for information on general details of construction. Note that as the front spar of the horizontal stabilizer is farther forward in the glider tail the bolt holes for the top longeron clips are spaced farther apart, as the fuselage is wider at this point than at the old spar position. The bottom wire bracing of the horizontal stabilizer no longer comes to a point at the base of the rudder post, but the rear pair of brace wires attaches there,

Above is shown the "Super-Soarer" taking the air as it is towed behind an automobile. At the left is this glider being towed by an airplane—the only method of launching by which sufficient altitude may be obtained for the loop. Towing by aircraft is now barred by the Department of Commerce unless a special permit is obtained.

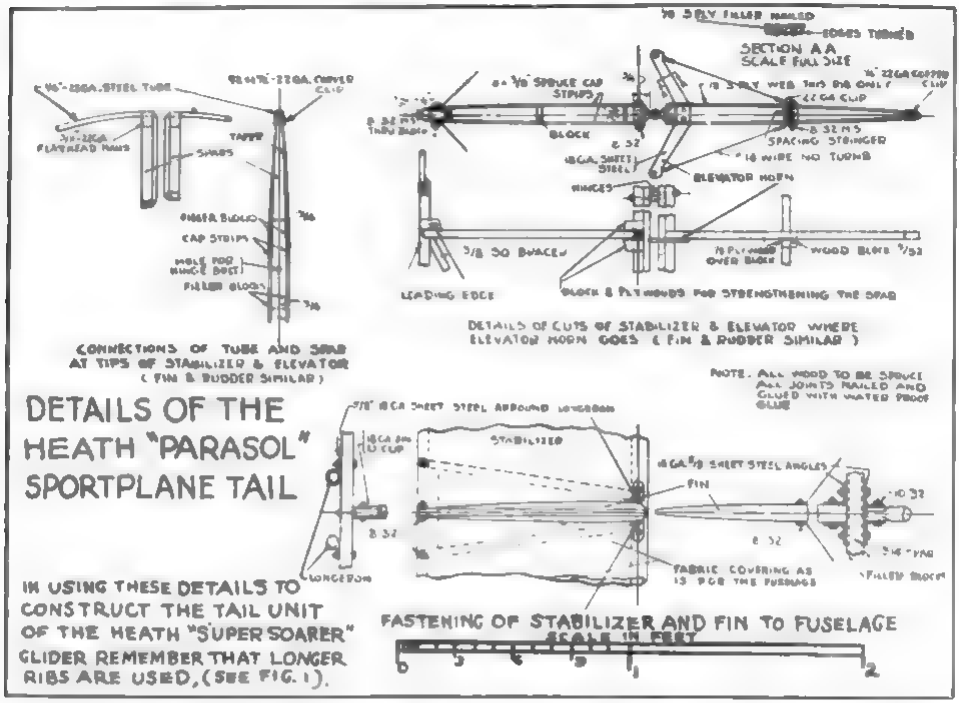


Fig. 6. A mechanical drawing of the tail unit of the "Super-Parasol." The construction of the glider tail is essentially the same, except that the dimensions are larger. See Fig. 4 of first installment.

and the front pair at the first bottom longeron fittings forward. Note that a 3/16" 3-ply plywood filler web is inserted glued and nailed between the cap strips of the horn rib of the elevators and rudder for stiffness.

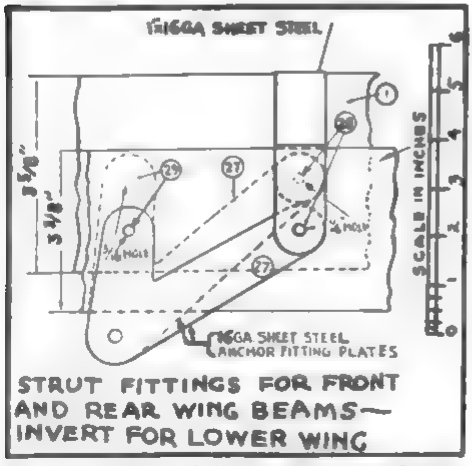


Fig. 7. A drawing of the wing beam strut fittings. Eight of these will be used in the construction.

The regular 3/32" control cable is used for the elevators and rudders but must be lengthened a couple of feet.

The tow cable end detail is shown well in Fig. 9. The 5/8" shock cord is passed through the 2" cable end ring and eight inches is lapped back on itself, where it is spliced with a heavy sewing of heavy linen cord saturated with wing dope. There is ten feet of this shock cord with another steel ring spliced in the other end in the same way, then 500 feet of 1/8" hard steel aircraft cable for attachment to the tow plane.

After the glider pilot releases the glider the tow plane flies to the landing field dragging the tow cable and drops the cable just before landing so it will not be lost.

The same equipment can be used for auto towing, which now seems to be the favorite method of launching.

This is great sport, and Fig. 9, A, shows how the shock cord and hook for the nose of the glider are prepared. Tow men brace their heels in holes in the ground and hold

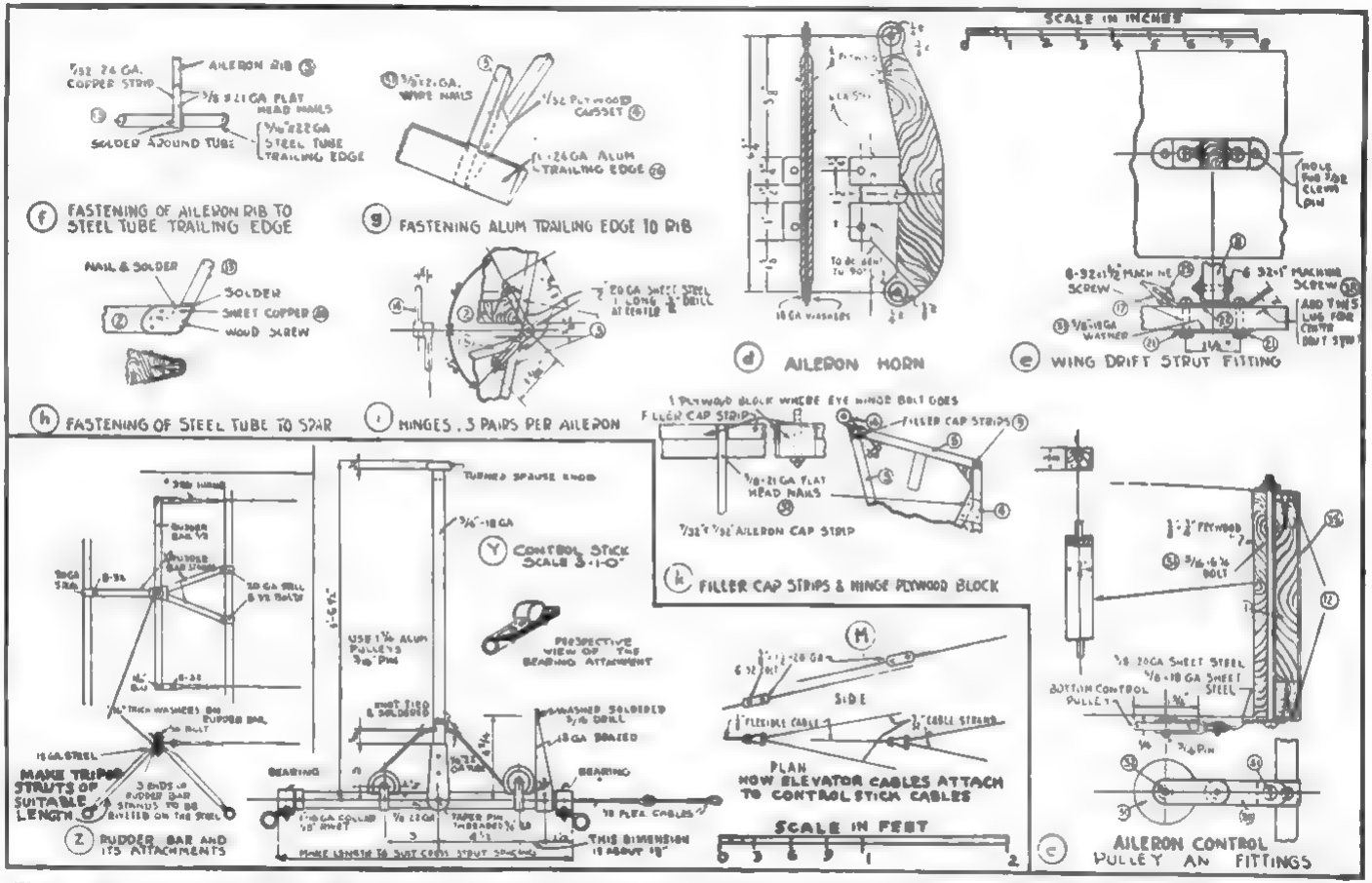


Fig. 8. This plate shows construction details of the wings and controls. The letters in the circles correspond with those shown in Figure 2 of the first installment. Except for the slight differences shown here, the wing and control construction of the Soarer is the same as for the Heath Parasol.

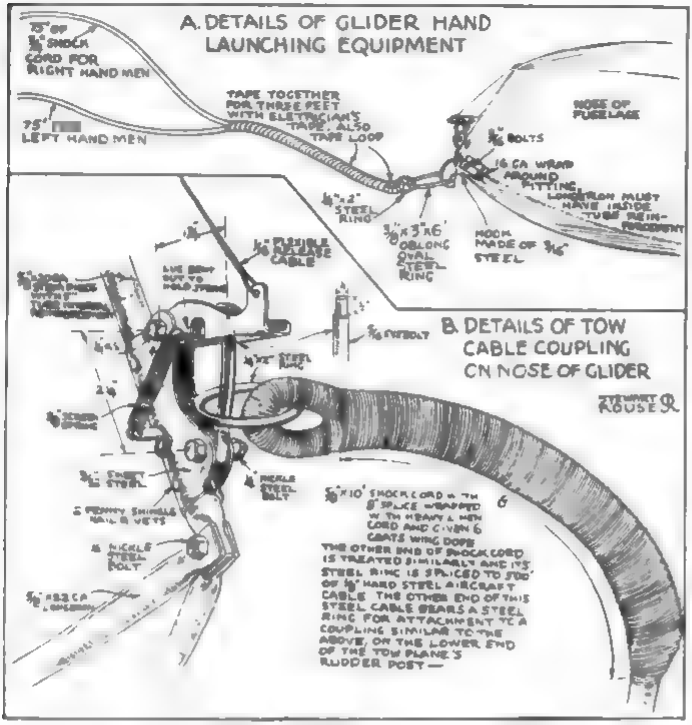


Fig. 9. Details of construction of the hand launching and airplane and auto towing equipment of the "Super-Soarer" are shown on this plate.

a short length of rope tied to the tail skid. At a word from the pilot the two groups of men on the shock cord ends walk forward about 100 feet apart until the cords are well stretched, then they run forward and outward and when the glider pilot thinks the rubber cords are tight enough he gives the word and the men behind the tail release their rope and the glider is catapulted into the air fast enough to go 100 feet high and glide or soar a long distance, at least 1,000 ft.

Beginners must be careful not to use much tension so as not to go very high, and the two crews of men should be at least 150 feet apart at the moment of launching to preclude danger of hitting them accidentally with the glider. It is hardly necessary to add that the launching must be done against the wind.

If the glider should prove nose heavy the upper wings should be moved forward, and vice versa.

The main thing in this light plane and glider sport is to be careful. Be sure that everything is strong and right, then go ahead with confidence and a light heart and have some fun!

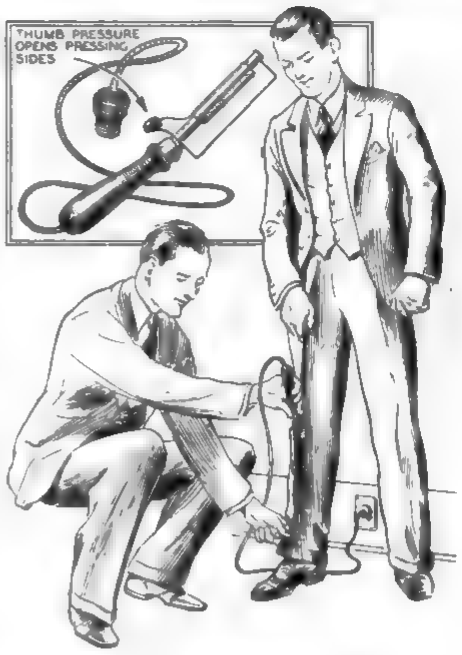
Those who do not have the plans of the Heath "Super-Parasol" will find them in the 1929 FLYING MANUAL, which may be obtained from the publishers for $1.00; or large blueprints may be purchased from the Heath Aircraft Company, Niles, Michigan.

Although this job is of extremely simple construction for those who have the Heath "Parasol" plans, it is frankly not a glider for the beginner unless a capable instructor is present to handle the towing auto. Those teaching themselves to glide should use a primary ship to get the feel of the air.

Handy Electric Presser Creases Trousers in Half Minute

PUTTING a razor-edged press on a pair of pants in less than half a minute—that's the feat that is performed by a new electric pressing device now being marketed. Consisting of two electrically heated plates operated by a thumb lever, the device opens to grip the fabric, and when run down the length of the leg leaves a neat edge that makes a baggy pair of pants look like new again.

In use, it is not even necessary that the pants be taken off. Simply shove the plug into the wall outlet and apply the plates.



Consisting of two electrically heated plates controlled by a thumb lever, this device makes neat razor-edge crease in pants in half a minute.

New Baby Cab Folds up for Travel

BABY carriages were once bulky, cumbersome affairs that required large storage space wherever any traveling was to be done, but a manufacturer has come to the rescue of harassed mothers, and is now marketing a carriage which can be folded up into a compact unit and stored away in a surprisingly small space. Added to this attractive feature are those of smart style, adaptability for every use, light weight, and greatest comfort and strength.

The new "TRAV-L-EEZ" stroller cab which folds into compact unit for travel on train or auto. Strength and style are the cab's chief features.

Scientists Debate Toast Question

CONTROVERSY is on in England between advocates of electric toast and those of gas toast. Beginning with a chance remark of Sir Frank Heath at a recent meeting of the Electric Research Association to the effect that toast made in modern electric toasters is far worse than old-fashioned toast made over a gas fire, the argument has drawn in cooks, dieticians and experts representing the gas and electric industries.

Those who agree with Sir Frank Heath's dictum against electric toasters point out that these devices usually are too hot and make the toast too quickly. The moisture inside the slice of bread does not have time to dry out. The result is soft, moist bread merely browned a little on the surface, leaving its inside unchanged. Spokesmen for the electric industry urge, however, that modern toast eaters want to save time and that this kind of surface-cooked toast is what the average person prefers anyway. Result of the argument seems to point out that preferences vary with taste of the eater.

INVENTIONS of the

The best thing about these dummy horses, invented by Joe Cook, is that no one can detect how they peek out of their hides. At the right is shown Joe's patented cocktail shaker, which permits the busy man to mix his drinks and exercise at the same time.

by JOE COOK
As told to Bennett Lincoln

WELL, sir, the days when a song and dance routine with a few gags strewn in between denoted that you were a comedian on the American stage have vanished.

You've now got to show the customers out yonder that you're a smart guy. The way I get around that is to slam-bang them with a load of cuckoo and complicated inventions. First they are baffling but then you soon realize that it's all in fun, as my partner, Dave Chasen, would say.

In this year of grace, and disgrace, for that matter, people don't storm the box-office just to hear some charlatan wise-crack for a couple of hours, trying to make the succumbed audience forget the financial embarrassment they might begin to feel. I'm not a blackface comic, and I never bended my knee to sing a mammy song. I don't wear a mask. I'm there behind the footlights, as advertised, Joe Cook in person.

The way I feel about it is that a blown-in-the-bottle 100 proof comedian today has got to be something more. In my case I feel that I'm an inventor. At heart, I'm a thoroughbred mechanic.

Why, let me tell you, sir, down in the neighborhood of Lake Hopatcong, New Jersey, I have a summer home and behind it I have a big barn. Of course it's not a barn any more. It's my laboratory. It's my workshop. There isn't a happier comedian in the world than Mr. Joe Cook the day he putters around his work-bench and tool chest down there at Lake Hopatcong.

In this latest show of mine on Broadway, called "Fine and Dandy", there are so many inventions and contraptions in it that the boys in the chorus have nicknamed me the Edison of the American stage. That musical comedy is chuck full of machinery. As a matter of fact the setting for the show is called the

Musical Comedy Edison

Long known as the "One Man Vaudeville Show," Joe Cook, star of the musical comedy stage and screen, has given further proof of his inventive ability in his latest success —"Fine and Dandy." Here he tells you of his nutty inventions which brighten the show.

There's nothing like keeping an office clean and neat. The flying cuspidor should discourage careless smokers.

Joe's desk, which he uses in "Fine and Dandy," embodies all of the latest improvements, including a private bar, worked by an electric push-button.

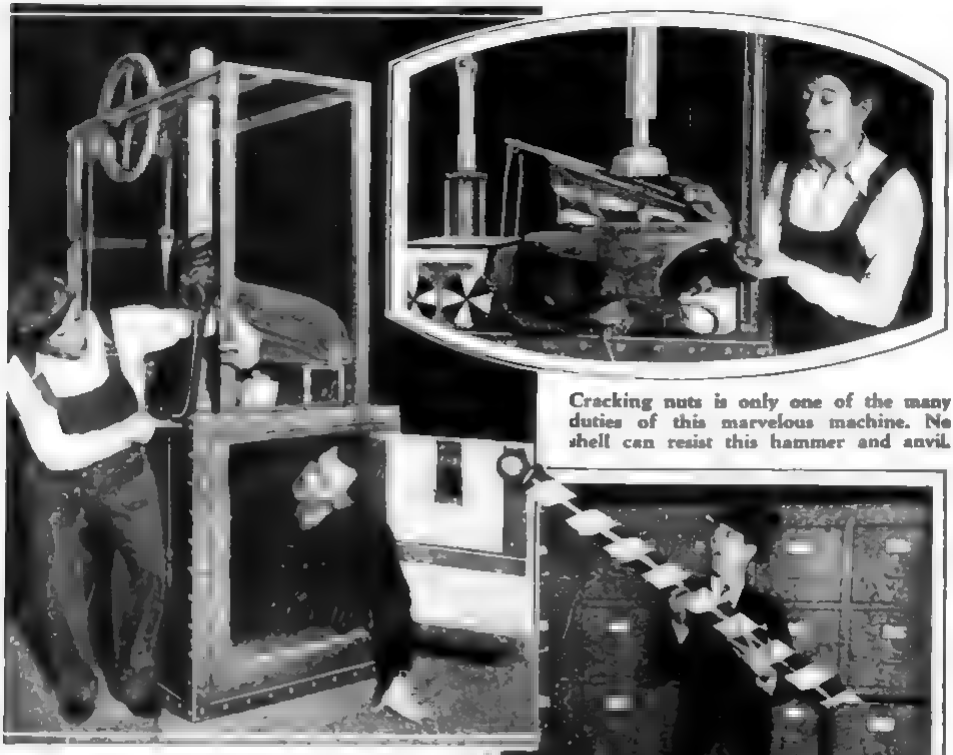
Fordyce Drop Forge and Tool Factory. And I bet there's hundreds and hundreds of persons who never dreamed that you could weave such a ripsnorting comedy out of the daily life in such a plant.

Although I appear to be very much occupied throughout the entire performance, there isn't much evidence that I do much work for Boss Fordyce. No sir, that's because I'm too busy perfecting my inventions. But even the boss's daughter thinks I'm a pretty good inventor. I manage to convince her and the first thing I know I'm appointed general manager of the works.

Well, sir, like any good general manager, I had to have a first class desk. And I did. However, I used an axe to open my mail and the desk began to look more like a butcher bench. Right beneath it, where you would have a wastebasket, I kept the flying cuspidor, in case any visitor had cigar ashes to flick or matches to toss.

In a side compartment of the desk I could produce coffee and doughnuts. But a little distance from this cabinet there was another trick arrangement. All I had to do was press a button and that part of the desk would open and reveal a layout of beverages and all the fixin's. No gainsaying the fact that a desk like that ought to suit the taste of the president of the biggest corporation in the United States. I'm not mentioning any names, either. I'm going to sell that invention some day.

In another act I produced three dummy horses. I invented them too. The best thing about those Dobbins is that no one can detect how they manage to peek out of their hides. And for dummy hosses they do some pretty slick performing. Well, sir, we had a lot of trouble breaking in those mules. They ran all over the stage at first. It took a ton



Cracking nuts is only one of the many duties of this marvelous machine. No shell can resist this hammer and anvil.

Inside stuff. Here Joe Cook reveals the motive power for his most complicated stage invention.

"The last general manager must have been a barber," says Joe as he looks through the files.

of sugar to train them. I had a great deal of practice in being kind to dumb animals.

My next mechanical hallucination is a knockout. I must have had a nightmare when I doped that one out. I appear on the stage driving a chariot, just like a Ben Hur. It is drawn by a dummy horse, and driven by an outboard motor and trailed by a sea-sled. The patent office must have got a kick out of that one.

I've been doing comic stuff on the American stage and in the movies for a good many years, but I don't know how I could ever fill the house with laughing gas enough to get the howling, shrieking guffaws which inventions like those provoke. It's a pleasure to see them out there rocking in their seats.

For instance, just think of that trick filing cabinet we got up. I go there to reach down for some very important paper and what do I find instead? I find a live skunk. The only skunk ever to appear on the American stage. In another cabinet drawer I find a barber pole. I don't know how to explain that, except that the feller ahead of me in the general manager's job must have been a barber.

I got one mechanical apparatus in "Fine and Dandy" which must be a pride and joy to any of the inventors and engineers who pay the box-office tariff to see it. It looks like a portable gasoline station. It's a combination machine for cracking nuts, busting balloons, making cigars, blowing up paper bags, scratching your back and for producing fruits and flowers. The latter is done through a boxing glove. You get socked, go to the hospital,

Balloon busting is made quite easy with this simple apparatus.

Here's the fruit and flowers attachment. You get socked by the boxing glove, are sent to the hospital, and your friends send you fruit and flowers. Or do they? Anyway, that's the idea.

A length of rope is fed into the machine, and out come five-cent cigars. You no doubt have a friend or two who smokes them.

then come the fruits and flowers.

This idea of mine of bringing mechanics and mechanisms to the stage gets into a faster stride a little later when the boss's wife tells me she wants to shoot some golf. I'm still in my overalls, but in a jiffy I turn my garments inside out and there I am in plus fours and golf hose, all set for the fairways. We have an improvised golf course with a slick sandtrap. By means of my own wire invention, I am enabled to make some astonishing putts.

The boys would certainly be disappointed in their hero if I didn't tell you something about the most remarkable invention I have ever devised. Like most of my engines, I haven't been able to get anything more than laughing pressure out of them. I mean you wouldn't exactly call them aids for the housewife or would the president of the General Electric Company decide that he would want to own my theatrical foundry.

There's one other invention of mine that I'd like to tell you about. Right now we're using it in "Fine and Dandy" but you never know when the good old days will come back, so I'd like you to paste this one inside your hat.

I got a nifty for the cocktail-shaking host. No doubt you've seen those springy things with handles at both ends. They're for improving the chest expansion and bulging the arm muscles. Well, you split one of those implements in two, right in the middle. And you insert a couple of clamps there instead. Then you mix your juices in a regular cocktail shaker.

Again the marvelous Cook Combination Machine proves its amazing versatility. Here's conclusive proof that the contraption can be adapted to the task of blowing up paper bags, thus greatly saving wear and tear on the lungs of the devotees of this sport. At the right is shown the clever arrangement Joe uses for opening his mail.

Next you insert the shaker in these two clamps. One end is inserted at the foot and you grip the other in your hand. Then you proceed to raise and lower your arm. The springs do the rest to your drink. It makes exquisite cocktails.

Whenever the name of Joe Cook is spoken among men who know a wise invention, I am told that they instantly think of my pet derrick. Yes sir, it's a pippin. And I'll leave it to you to guess how many midnight oils were spent in concocting this one, which was described in a previous issue of this magazine.

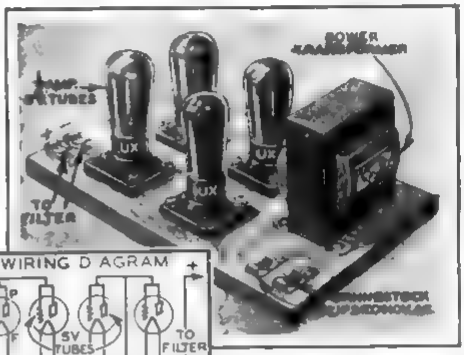
Well, sir, for a fellow who's supposed to be the general manager of a foundry, they put me through a lot of paces in my latest show. I sing and dance, juggle illuminated clubs, balance vases on a pole on my chin going up a ladder, balance a ladder with a man aloft on the balls of my feet as I lie on my back and a string of other tricks I never invented. But during moments when I'm offstage I'm always figuring out some new gadget, trying to dope out some mechanical device which will make 'em laugh and laugh louder. I hope some guy that's smarter than me at these stage inventions doesn't manufacture a robot to take the place of Joe Cook. I'd like to be able to do that myself.

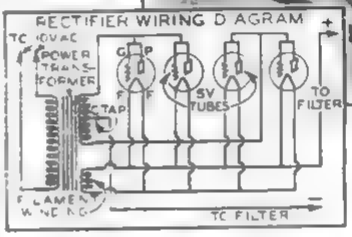
SPARKS from the RADIO EDITOR

Edited by L. B. ROBBINS

Discarded TUBES Make A. C. Rectifier

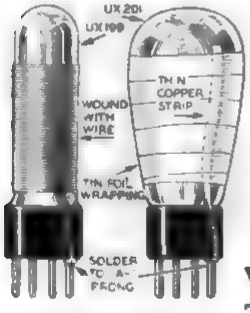
FOUR old receiving tubes, preferably one or one-half ampere tubes of the 171 type, mounted on a baseboard and wired up to a power transformer, will make an efficient rectifier for your receiving set or your low power transmitter. First wire the plates and grids of the four tubes together, then connect the plates and grids of two of the tubes to one side of the high voltage transformer, and the plates and grids of the two remaining tubes to the other side of the high voltage transformer, as illustrated in the wiring diagram at the right. The center terminal of the transformer goes to the minus terminal of the filter.





Tubes and power transformer of improvised rectifier are mounted on baseboard as illustrated above. Wiring diagram shows hook-up of tubes.

If you have no filament lighting transformer in the pack, a heavy duty bell ringing transformer can be used instead. The tubes are wired in parallel, one side of the filament transformer going to the positive of the filter used in the receiver.



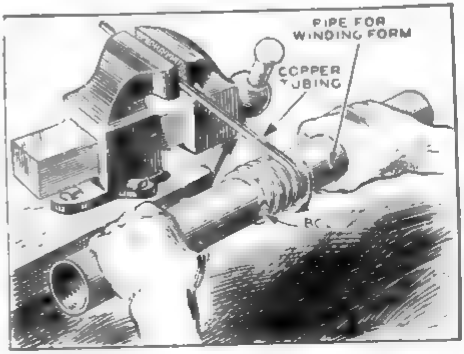
Apply wire, foil as shown.

Killing Hum in Battery-Operated Receivers

THOSE persons using battery operated radio receivers near electric light lines are often troubled by a 60 cycle hum which in many cases drowns out weak music. If you are using 199 or 30 type tubes you can remedy this by winding the glass with small wire and binding it at the top. For balloon shaped tubes, cover the glass with a strip of tinfoil, secured by shellac, and wire to the "A" prong, as illustrated at the left.

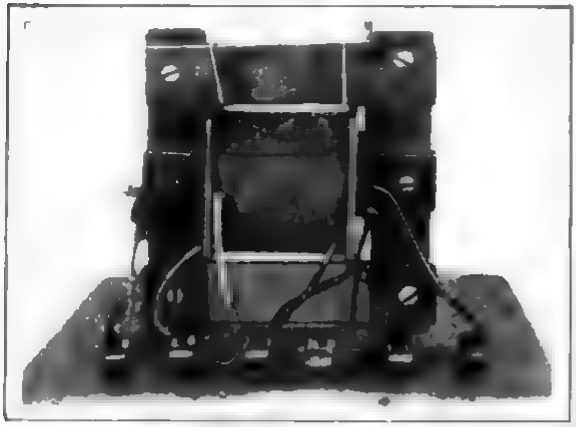
Winding Copper Tube Inductances

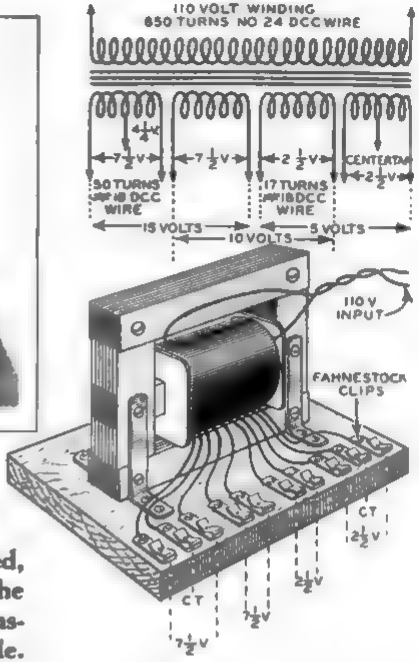
IF YOU have on hand the task of winding coils of heavy copper tubing for transmitter inductances, you will find the task much easier if you use a vise and a pipe in the manner illustrated in the drawing at the right. First drill a hole in the pipe, then flatten an end of the pipe and drill that, too. Next clamp one end of tubing in vise and bolt other end to the pipe. To wind, hold the pipe and turn slowly away from you.



To wind tubing, turn pipe inward as illustrated.

Home Made All-VOLTAGE





Completed transformer is shown above. Note in wiring diagram at right above the combination of voltages available. Leads are wired to clips as shown at right.

Delivering any combination of voltages desired, this easily-made transformer will prove just the thing for your AC receiver or low-power transmitter. Construction is surprisingly simple.

IT IS not a difficult matter for a radio experimenter to wind a filament lighting transformer to give practically any desired voltage. By following the accompanying diagram and text you will be able to make a satisfactory job of it at only small cost.

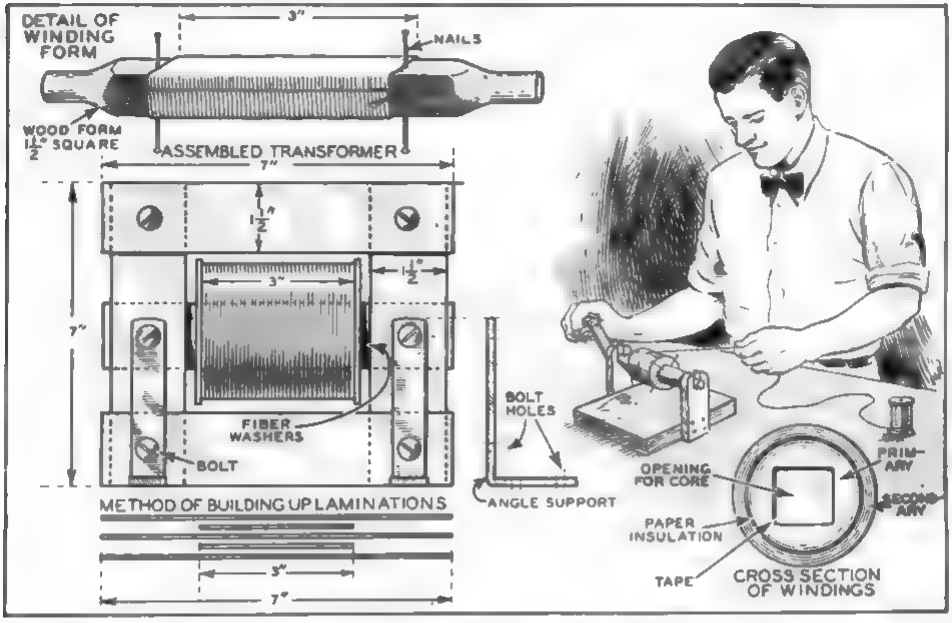
First construct the winding form. This consists of a piece of wood six or eight inches long and 1½ in. square. Shellac it and then wax it to give a slippery surface. Now measure off a space about 3 in. long in the middle. Wrap this with several turns of heavy paper, shellacking the spaces between the layers to hold them. Do not, however, use shellac between the paper and the wood. Drive a small wire nail in each face of the wood and at each end of the paper to retain the windings. You are now ready to wind the primary.

Start at the left end of the form, and, catching one end of the wire around one of the nails, wind on about 650 turns of No. 24 enameled DCC wire. Each layer will consist of approximately 90 turns. Wind as tightly and evenly as possible. When the layer is finished wrap a layer of waxed paper around it and then start back on the next layer, keeping this process up until the required 650 turns are on, and catching the outer end of wire over a nail at the nearest end. Now cover this primary coil with several layers of shellacked paper, allow to dry and you are ready to wind the secondaries.

These are wound in the same manner, except that No. 18 enameled DCC wire is used. The two 7½ volt windings consist of 50 turns each. One is center tapped at the 25th turn while the second has no center tap. Cover these with paper and then put on the two 2½ volt windings which consist of 17 turns each. Center tap one winding at midway between the eighth and ninth turn. Label all turns ends and then wrap the entire coil with electricians tape, varnished cambric or heavy paper.

The core consists of laminations built up as shown in the diagram. All are 1½ inches wide. Have a tinsmith cut them from black stove pipe iron, No. 26 or No. 28 gauge. The top, bottom, and center laminations are 7 inches long. Ends are of same length, but 6 inches will suffice. Then have additional

FILAMENT TRANSFORMER



Primary and secondary windings are first wound on wooden forms. Laminations for various parts should be built up as illustrated and fastened together with bolts, which also secure angle iron.

ones cut 3 inches long as fillers for the center pieces as indicated in accompanying drawings.

First shellac all laminations and pack together while tacky. Alternate the 7 and 3 inch pieces for the center, building up a pile 1½ inches thick. Remove the wooden form from the coil after pulling out nails, and push the core through the square opening, allowing the 3-inch laminations to come just at the ends of the coil. Now insert pieces for both ends and finally insert laminations for the top and bottom between ends of the side pieces. Drill all corners and union of the core with the sides and bolt the laminations tightly together. If the laminations tend to vibrate under load, fill all spaces with 3 inch pieces, which will cure this trouble.

Mount the transformer vertically on a heavy board by means of four angle irons bolted to the core as shown. Then lead the various voltage taps, as well as the ends of input winding, to clips of binding posts on the baseboard.

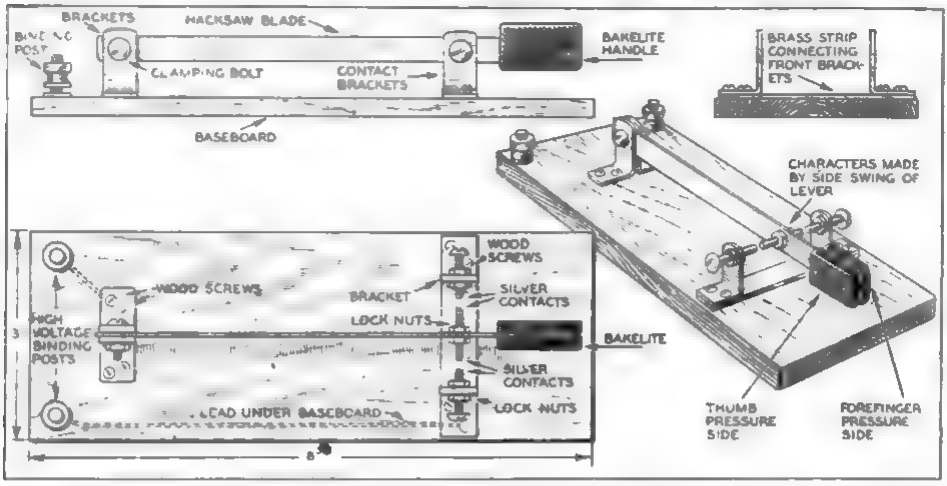
By referring to the diagram it will be noticed that from 1¼ volt up to 15 volts can be obtained by using half windings or combining various coil sections. This range will light practically any tube desired.

If coil vibrates from the 60 cycle impulses drive small wooden wedges between it and the core, being careful, of course, not to disturb the insulation. If coil is found to heat unduly it is an indication that too many tubes are being lighted and the output should be reduced. If a reduction of voltage is desired beyond that which can be obtained from the windings, simply put a heavy power rheostat in the 110 volt input.

The task of winding on the primary and secondaries will be much easier if you whittle down the ends of the winding form and rig up the mounting as illustrated in the above drawing. A crank should be nailed to the end of the form. With this arrangement all you have to do is turn and hold the wire as it winds on.

The chief advantage of this little transformer is that it will deliver voltages for any combination of tubes in a receiver or transmitter. The baseboard clips should be marked with various output voltages.

Hack Saw Blade Makes 'Bug' Key for High Speed Sending



Lever and contact points of "Bug" speed key are mounted on baseboard as shown here. Leads from front and rear brackets are run under base. Dots and dashes are made by swinging lever from side to side. Threading of contact points should be tight for best adjustment.

FOR those amateurs who have accomplished speed with the code, this easily made "bug" will find an appeal because of the ease and high sending speed that can be attained with such a key. One of simple construction is shown herein and will well repay the *speed hound* for building.

First make the base of hardwood about 8 inches long and 3 inches wide. Place a pair of binding posts at the rear end. The blade consists of a thin hacksaw blade, with the teeth ground off. Cut the blade about 6 inches long. Clamp the end with the hole in it solidly between two brackets of stiff brass by a strong bolt. Mount the brackets in the position shown in the above drawing.

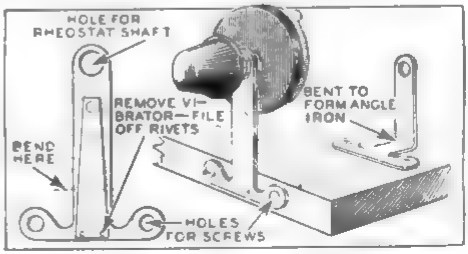
Then drill a hole back 2 inches from the opposite end of the blade and insert a threaded brass bolt with its head removed. Lock it to the blade with two nuts so equal lengths project from each side. Solder silver contacts to each end of this bolt. Two pieces of bakelite or hard rubber 1½ in. long by ¾ in. wide riveted to the end of the blade as shown serve as a handle. Countersink the rivet heads to prevent shocks.

Mount two front brackets similar to the rear ones on the base as illustrated. Connect them by a strip of brass underneath and drill and tap holes near the top, opposite the lever contact points. Into these holes thread contact screws with silver contact points. Adjust the two bracket screws until the contact points at each side are about ⅛ inch apart and wire to the high voltage binding posts as illustrated.

Dots and dashes are made by swinging the key lever from side to side, first against one contact and then against the other. Some practice may be necessary, but sending will come much easier.

Coil Vibrators Make Mountings

THE set builder is often stumped for want of a mounting bracket for "one hole" variable condensers, rheostats, etc. This is where the vibrator of an old Ford coil comes in handy. The center hole is just right to take the shafts of the instruments. The front strip should be filed off and the vibrator bent at the point shown. Bottom holes take the base board screws for the mountings.



Parts are mounted on vibrator as shown above.

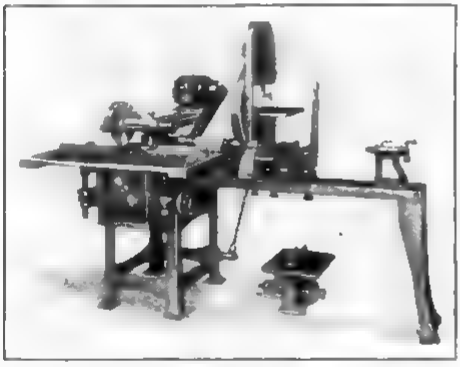
Curved-Edge Yacht Boom Gets Greater Speed From Sails

A NEW departure in racing yacht rigging is represented in the development of a swivel boom which combines the highly desirable features of lightness, stiffness and strength. Perfected by Roy and Guy Pigeon, noted yacht and rigging builders of Boston, Mass., the boom is constructed from a thin flat board reinforced along the edges with heavier strips of wood.

One edge of the boom is straight, the other is curved to the shape which the designers believe to be most effective for attachment to the foot of the sail. With the foot of the sail held to the track along this curved side, the wind is prevented from escaping off the lower sail space. When the boat is tacked or brought about the boom turns smoothly by means of a swivel set at the forward of the straight side. The boom will make its debut on a class "I" eighteen foot yacht.

Roy and Guy Pigeon, yacht builders, examining their new light-weight, reinforced boom, with curved edge to prevent escape of wind from sails.

Complete Shop in One Machine



Powered by motor, this "Beaver Shop" combines all necessary woodworking units in one.

A COMPLETE workshop in one machine —that is the feature of the recently developed "Beaver Shop" now available to home craftsmen and woodworking professionals. Powered by a single motor operating off house current, each of the units is individually driven without waste, due to a special arrangement of the shafts which makes idler pulleys and multiple belting unnecessary.

Among the units provided are: a slide saw for cross cutting, mitering, dadoing and tenoning; an underslung rip, groove and plough saw; a 4 or 6 inch joiner; and a precision band saw with tilting table.

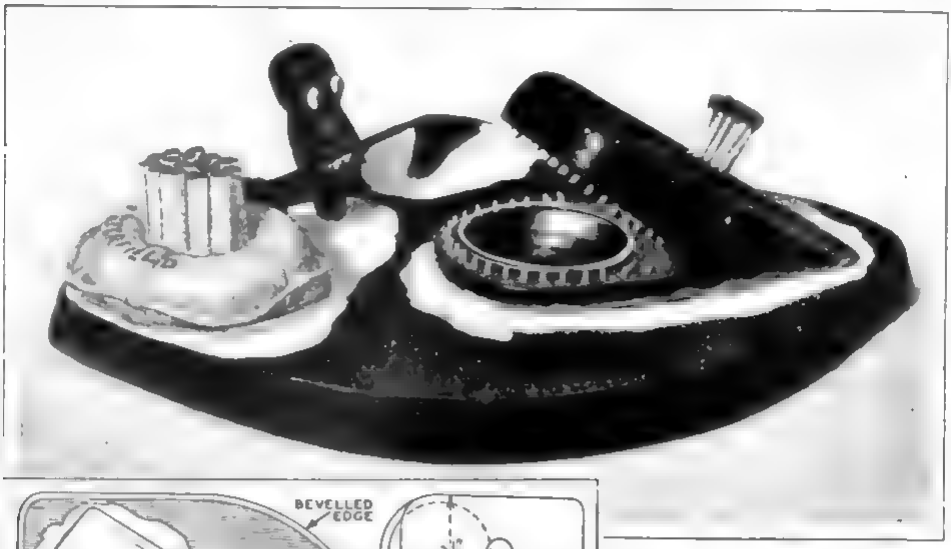
Handy Portable Auto Bath House

MOTORISTS driving out to the beach for a plunge need not worry in the least about bath house facilities, for a portable dress tent which can be erected alongside an auto in a jiffy has recently been put on the market. Designed especially for use with closed cars, the tent consists of only three parts—the canvas cover, the frame, and the bracket which attaches to the car to serve as a center pole.

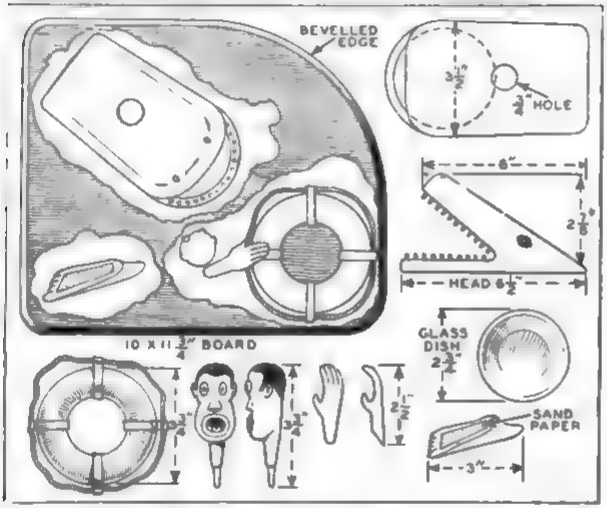
A special arrangement of the frame assures complete privacy and when out of use the tent can be folded up and locked in car.

Supported by bracket attached to car, portable canvas bath house above provides beach privacy.

Comic Sea Drama on Smoker's Tray



This distinctive ash tray, depicting whale about to gobble up frightened native, will make attractive smoker's ornament. Matches are held in whale's blow hole, cigarettes in the life belt.



These drawings give dimensions of parts. Note particularly expression of native's face. Cut the base to any size you wish and lacquer it sea green, with dash of white to represent foam.

THIS amusing little smoker's tray, a caricature in wood, depicts a scene in an imaginary tragi-comic drama being enacted on a sea of green lacquer. Note the open-mouthed, speechless expression of our little frightened tragedian and the smile of glee and delightful anticipation on our comedian, Mr. Whale.

The little man is made from a piece of white pine or other soft wood. To get the desired expression make his chin sag, his mouth gape and his eyes bulge. Stain the face a chocolate color and varnish. Lacquer his lips a turkey red. The eyes are white with black elongated dots and the hair black. The teeth are made from a corrugated fastener.

The foot and hand are of wood, carved to dimensions given at left. The life preserver can be made in a number of ways. The easiest way is to use a wooden curtain ring. Make a twine loop a little larger than the life preserver and secure it to the preserver with four bands of tape. The whale is made from a piece of 4″x4″x7″ wood with a mouth cut to an angle of 33 degrees. The mouth is cut out in the shape of a circle to fit a circular glass ash tray.

Fit the tray in the mouth so that it comes flush with the lips. Bore holes in the lips for the teeth, which are made from tooth picks and glued in the holes. Bore small holes in the whale for his nostrils and eyes. The whale is painted or lacquered black, the mouth, blow hole and nostrils red.

Amateur Electrician

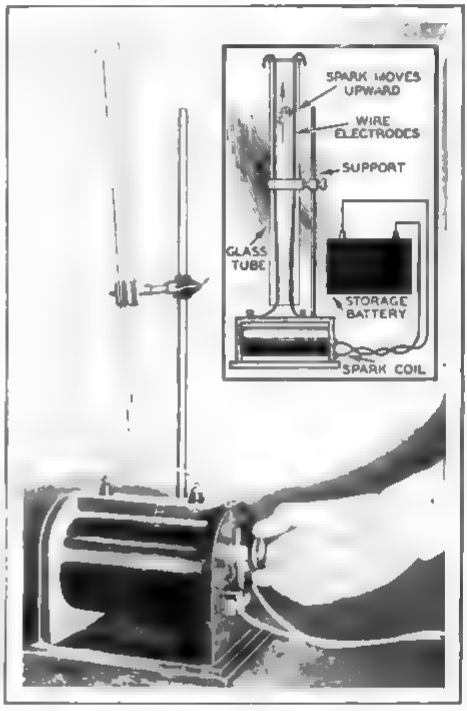
Edited by SEWELL LEHMAN

SPARK Coil TRICK for Window Display

AMONG the numerous tricks that can be performed with a small spark coil is one that is spectacular enough to make it valuable as a window display or for use wherever else attention is to be attracted.

In addition to the coil, obtain a long glass tube of large diameter, a pair of bare copper wires several inches longer than the tube, and a stand and clamp for supporting the tube. Connect one wire to each of the coil terminals, and run it through the tube, fastening it at each end by bending over the edges of the glass. Mount the tube vertically, and adjust the wires so that they are on opposite sides of the inside opening, and are slightly nearer each other at the bottom than at the top.

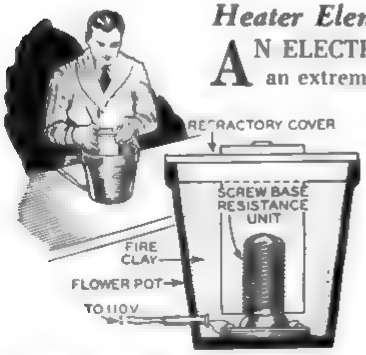
Now, when the coil is operated a spark will form at the bottom of the tube, and will be carried gradually upward by the rising current of heated air. Reaching the top, the spark will break, and immediately another will form at the bottom, and travel to the top. This continues indefinitely. Of course, slight adjustment of the wire gap may be necessary before the operation will proceed smoothly. A one or two-inch spark coil will be suitable for the job.



Spark coil and tube are rigged up as shown here.

Heater Element and Flower Pot Make Electric Furnace

AN ELECTRIC furnace of the crucible type capable of producing an extremely high temperature will prove a very serviceable piece of equipment for your work bench. Heat in this furnace is created by a 550-watt screw base electric heater unit, which should be mounted in an ordinary flower pot and the lead run out a hole in the sides as illustrated in the accompanying drawing. This much done, your next task is to mix a quantity of fire clay and place it in the bottom so that it completely covers the porcelain socket. The sides of the crucible are likewise covered with an inch or two of cement so as to have a cavity in the center about 3 inches in width. The furnace is then ready for fusing metals, heating flasks or beakers, preparing chemical compounds or tempering tools.



Porcelain heater socket is mounted in base of flower pot and fire clay applied as illustrated in the drawing above.

Simple ELECTRIC EYE Rings

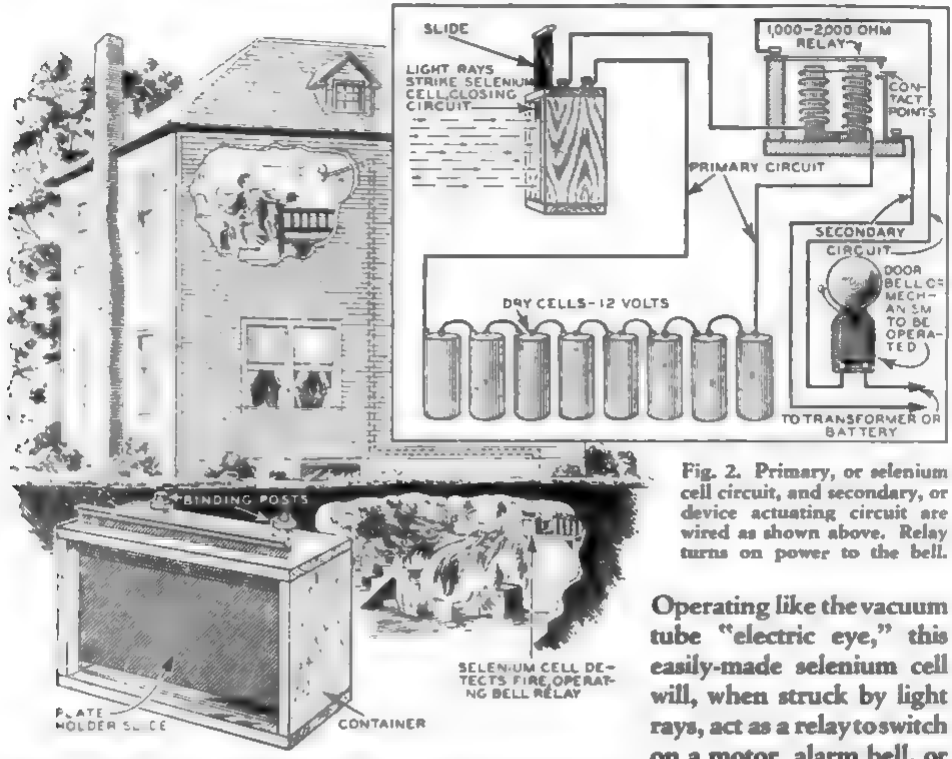


Fig. 2. Primary, or selenium cell circuit, and secondary, or device actuating circuit are wired as shown above. Relay turns on power to the bell.

Fig. 1. Mounted in basement, the cell will make an efficient fire detector. Slide in front of cell box serves to shut out light in daytime.

Operating like the vacuum tube "electric eye," this easily-made selenium cell will, when struck by light rays, act as a relay to switch on a motor, alarm bell, or any other electric device.

ANYONE interested in experimental electricity can gain a great deal of knowledge and pleasure from the construction of this light-sensitive selenium cell, and have also a handy electric eye that will actuate through a relay any bell, motor or magnet circuit in the bargain.

First, in making the cell, notch the long edges of a piece of mica with about twenty teeth, and drill small holes in the corners, as illustrated in Fig. 3. Next tie the end of a length of No. 18 wire to one pair of holes in the mica and wind on approximately 10 turns, using every other notch along both top and bottom edges. Pull tight and tie the opposite end of the wire in the holes at the opposite end from where it was first tied. Do the same with the second piece of wire, tying the ends in the opposite corners. Fig. 3 will show this plainly. Then test out each winding as illustrated in Fig. 4. If the two windings touch at any point the lamp will light.

When the cell form is OK, it is ready for preparation with the selenium, which should be the kind called "electrolytic". You will need a stand of some sort, a bunsen gas flame, a sand bath with cover and a thermometer reading up to 450° F. Provide a hole in the sandbath cover for the thermometer. Lay the cell form on the sandbath cover. Heat the cell this way until a stick of selenium will melt when the cell is touched with it. Then quickly cover the cell form with the melting element until it is entirely filled between the wires. Smooth out any lumps that form. To do this maintain a temperature as close to 428° as possible by raising or lowering the flame.

When the cell is filled and smooth remove it and let cool slightly. Lower the flame until the temperature holds around 248° in the

Fire Bell, Opens Garage Door

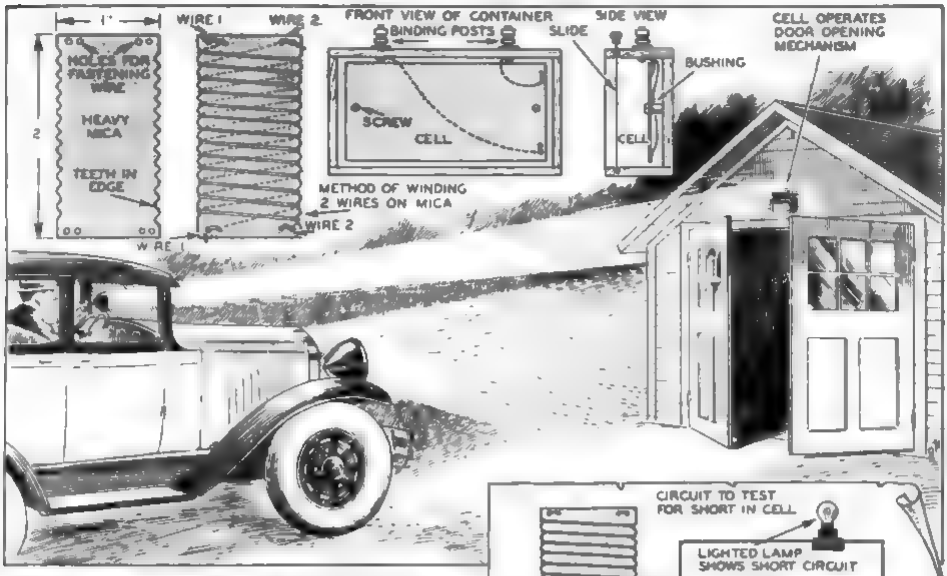


Fig. 3. Drawings at top illustrate winding of wires on mica and mounting of cell. Mounted on garage the cell will operate door-opening mechanism.

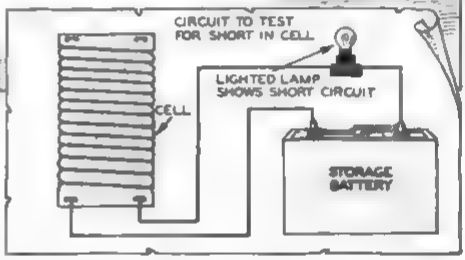


Fig. 4. If cell shows a short when wired up with circuit shown above, the wires should be gone over carefully to locate and separate contacting points.

sandbath and then replace the cell on the cover and allow it to heat up slowly. This will crystallize the selenium and it will turn gray. Increase the temperature carefully and watch for the first sign of melting. This is shown by the edges of the selenium turning black. At the first indication remove the cell quickly, turn down the flame slightly and replace the cell. Repeat this until the heat is maintained just under the melting point. Then cover the cell with a hollow glass cover such as small glass butter dish or the like and allow it to season under this heat for three hours. When this period is up turn down the flame gradually for the next hour, then put it out altogether. Cover the affair with a heavy cloth or asbestos pad and allow it to become cold.

Now test the cell again for electrical shorts. If found perfect it is ready for mounting. Make a small wooden box into which the cell will just fit and mount it as illustrated in Figs. 1 and 3.

Close the front of the box with a slide, which can be made from an old photographic plate holder.

The hookup is shown in detail in Fig. 2. The cell, magnets of the relay and eight dry cells are wired in series. Use only a high resistance relay, preferably one of from 1000 to 2000 ohms resistance. The device actuating circuit is operated through the contact points of the relay. The relay points should be adjusted so the current will not quite close when the slide is closed. When light is admitted, the points should close sharply. Finally adjust the current flow for best action by means of a rheostat or removal of batteries.

The secondary circuit can be actuated by any available means of power from one cell up to the current of the lighting mains. Its uses are many, as suggested in the accompanying diagrams, and need only be limited by the needs of the user.

For heavy currents you may have to immerse the relay points in oil or shunt them with a suitable condenser to prevent sparking or burning of points.

Outfitting EXPLORERS for

Major Anthony Fiala, veteran explorer and soldier in three wars, outside his "Adventure Shop" in New York. He has outfitted Wilkins, Byrd, Roosevelt, Dickey exploring expeditions.

Explorers must carry emergency supplies for disasters. This photo shows the "America," of Fiala-Ziegler expedition, crushed by the pack ice.

by

KENNETH COLLINS

Modern explorers striking out into uncharted regions must be equipped for every emergency. Here a veteran explorer tells how these preparations are made at great costs.

BEFORE an explorer strikes out on his hazardous journey into some remote and uncharted region of the world, he is confronted with the prodigious task of laying in a stock of supplies and equipment that may range from airplanes to can openers.

"How does the explorer go about making such provisions for his expedition?" you may wonder. "Where does he begin? How can he determine what supplies he will need and in what quantities he will need them? What precautions must he take? And, finally, where does he purchase his unique equipment?"

Instruments to take scientific observations, foodstuffs sufficient to feed a young army of men, clothing that will provide protection against the hottest heat or the coldest cold, firearms to beat off attacks of wild beasts, and maybe wild men, medicines to combat deadly fevers, and even trinkets to win the good will of hostile natives—these are a few of the items to be considered.

An outstanding authority on the question of equipment for exploring expeditions is Major Anthony Fiala, who is keeper of the famous "Adventure Shop" in New York, the most unique store known to the world of science and adventure. It is his business to answer the aforementioned questions for potential explorers, and to furnish them with the supplies they will need.

"When a person bent on exploration comes into my shop I can size them up at first

High-Priced Adventure

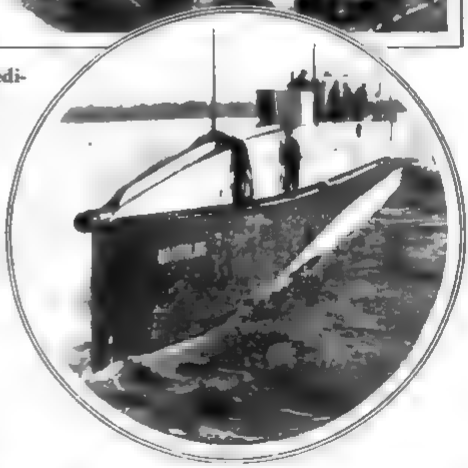
Above—Sledge column of Fiala-Ziegler Polar expedition crossing pack ice en route to North Pole. Food and clothing must be especially adapted to bitter cold weather. Below—Expedition making camp. Equipment for adequate rest is of vital importance to endurance of men and animals.

glance and tell whether they contemplate going on a Sunday school picnic or if they are qualified to cope with the hardships and rigors of unblazed trails in the ice or jungles," explained Mr. Fiala.

"After my visitor has told me of the desired destination, we sit down to figure out a sort of budget plan. Under no circumstances should any one consider going far outside the limits of his native city with less than $500. Expeditions are very costly. A great many explorers die in poverty chiefly because of the high price of the explorations they undertook.

"If you want to get some idea of the high cost of living when you live in the remote worlds where explorers go, let me quote to you my latest figures for a group spending a year in Asia's interior:

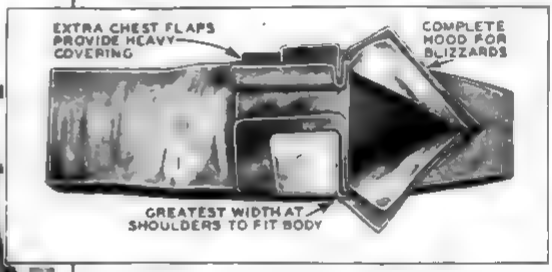
"The allotment of food to this exploring party has been divided into a series of 24 cases, containing 226 food rations. Each case contains four days' food for three men. It is costing this party $1,081 every four days, since there are six men on the expedition. You can see that the end of a year will bring



Major Fiala furnished provisions for Sir Hubert Wilkins' submarine expedition to North Pole. Above photo shows "Nautilus" making test run.

Admiral Byrd, whose South Pole expedition was a masterpiece of planning and foresight. Upper left—Billy, "America's" mascot, taking a cold bath.

Equipment of modern explorers must include movie cameras and even talkie apparatus. Photo shows Major Fiala making movies from deck of Asuncion on Roosevelt River of Doubt expedition.



The sleeping bag—a highly important piece of equipment for polar explorers. Made of pure fiber wool, the bag shown above, invented by Major Fiala, is very light and extremely warm even in blizzard weather.

their food bill up to close to $100,000.

"If you are planning a still grander and up-to-the-moment expedition and are going to take along a couple of airplanes, I can provide you with those, too. But you can see where that is going to run still higher into big money. Electrical equipment, including radio apparatus is nowadays an indispensable item. The motion picture camera, and even talkie equipment to go with it, is making adventure in the tropics and the Poles more costly.

"In laying plans for an expedition we must start with the figuring out of the food supplies. After many years of experience in sending out expeditions into every quarter of the globe, I have compiled a list of foods which compose a scientifically balanced diet. It is not only a matter of calculating the proteid content and the number of calories and vitamins, but it is also highly important that the food be palatable.

"The carrying facilities are also taken into consideration. I wouldn't recommend that a polar expedition load up on strawberry and blackberry jam, exactly. Hardier dishes form the Arctic man's feast. Pemmican, canned beefsteak, roast beef, sausages and salmon are the mainstays of the ice-zone explorer.

(Continued on page 196)

MOTOR MECHANICS

Edited by RAY F. KUNS

Why GAMBLE With SPARK PLUGS?

SPARK plugs are taken so much as a matter of course these days that unnecessary chances are sometimes taken on their continued performance.

Checking over the spark plugs, cleaning and adjusting them was almost a daily chore for many years. With the perfection of plugs and other units of the ignition system, spark plugs have come to the point where they are really forgotten about. It is seldom that trouble is experienced. It is likely true that owners have gone to the other extreme by neglecting the plugs. It is this neglect which results in conditions such as that existing with the plugs illustrated.

The porcelains of the end plugs are badly burned. The central electrode of the plug at the left center of the photo has been burned completely away. Originally it extended about ⅜" beyond the plug shell. The plug at the center right has a gap of approximately ¼". This gap should be about .025". In other words, it is ten times as great as it should be. Small wonder then that the owner of the car, fitted with these plugs in this condition, should be complaining about car performance, hard starting, lack of acceleration and poor power.

Weak or improper spark for ignition of fuel costs the car owner money. The irregular operation of the automobile engine is hard on the parts of the automobile. Unnecessary shock and vibration is encountered and much fuel is wasted.

The question then arises, why do owners gamble with their spark plugs, permitting them to get into the condition of those shown, which is not as unusual as might be thought. Very largely this is due to the fact that the element of chance was so largely removed from the spark plugs. At one time the manufacturer of a large production six cylinder car placed an extra spark plug in each automobile when it was delivered. So many of these automobiles came back to the dealer's floor as used cars, two or three years later, with the additional spark plug still in its original container that this practice was discontinued. However, the spark plugs should receive reasonable attention. They should be checked over at least once in each 5,000 miles. They should be kept free of soot and carbon. They are easily cleaned with a little gasoline and alcohol. They should be kept adjusted to a proper clearance of .022" to .028", all plugs being set exactly the same. And finally, when the central electrode has been burned away it is more than time to discard the plugs in favor of new ones, which will really save you money.

Gambling with spark plugs is always a losing proposition. Plugs like these will ruin your engine.

Covering Engine When Washing a Car Prevents Shorting

Draping a waterproof cloth over the engine will permit the use of the hose without danger of shorting the distributor and wires.

OWING to the location of the distributor and certain of the high tension wires, it is difficult to wash some automobiles without having them become "shorted" owing to the moisture which will be collected about these units.

It is an easy matter to provide a rubber coated or gummed cloth which may be draped over the engine while washing it. This will prevent any water which is splashed through the radiator or through the louvers of the hood from actually reaching the sensitive electrical cables and the distributor. At the same time it permits of the use of the hose so as to actually get the dirt away from the hood and about the radiator.

Hollow Knob Holds Registration

ANOTHER automobile accessory novelty has just been brought out by a Lynn manufacturing concern, known as the "Kum-A-Part Knob." The upper half of the sphere comes away from the lower half, which remains on the rod, held in place by the usual threaded socket, which is attached to it and screws down on the gear shift lever.

The hollow knob is large enough to contain folded license and registration papers, and also an extra ignition key, with room left for an extra rumble seat key. The knob is made of bakelite, and is available in various colors.

This hollow knob solves the problem of a safe place to keep license and registration.

Reflector Reveals Dead Headlight

HAVE you ever been called by the traffic cop because of a dead headlight which you never knew was out? If so, you will appreciate this little idea.

It consists of a small red or green reflector set which is soldered over a quarter inch hole on the upper back of the headlight. A small hole is also bored in the headlight reflector in line with the bulb and set, permitting a small beam of light to pass through.

Simple details of headlight telltale construction.

Tips on Caring for the Battery

IF YOU contemplate starting on a long trip, have the charging rate of the battery set back.

Clean the battery terminals occasionally and give them a coat of cup grease or vaseline.

If you would save the battery container, it is a good plan to have it cleaned once a year and painted with acid-resisting paint.

Allow for Turning Space When Designing Garage Drive

THE problem which must be solved when designing a drive for the house in the city is not always easy. The amount of space available for turning the car in back of the house, in order to get it into the garage, may be very small indeed. When possible to do so it is a good plan to drive your car in before ever locating the garage or attempting to lay out the apron on which it is proposed to maneuver the car when getting it into the garage or out.

It is rather surprising to see the mistakes made in laying out this sort of apron. Inexperienced people will imagine that a car will handle in a certain fashion, only to find that they have spent considerable money and taken up considerable room, most of which does not do much good when an attempt is made to turn an automobile on it.

The turning ability of an automobile is governed by the turning radius and a number of other things. If your lot is solid enough to permit driving the car over it, use it to lay out the turntable or turning platform. Experiment until you learn just where the garage should be located and where the turning table or platform should be located and what size and shape it should take. Not infrequently a "Y" form can be used to great advantage and lend itself to a little landscaping and beautification.

A little experimentation with the automobile will usually show how to lay out the concrete turning apron for most effective use. The above drawing suggests a convenient plan for a long, narrow lot, when the garage is built into the rear of the house itself.

Rear Seat Bed Permits Taking the Baby on an Extended Motor Tour

This rear seat bed, which is quickly installed, will keep the baby safe and comfortable on a tour.

WHEN the baby comes along, many confirmed motor tourists abandon their favorite method of spending their vacations, for an extended motor tour has usually meant that the mother or some other member of the family must hold the youngster during the entire trip. This is no longer necessary, for a device recently placed on the market makes a bed of the rear seat of any car, so that baby may travel in safety and comfort on even the longest trips.

A stout metal frame fits against the rear seat cushions and is held on by two cords at the top which go to hidden screw eyes in the corners of the car. Two push pins at the bottom of the frame fit into sockets in the floor board, allowing the frame to be placed in position in a very few seconds. The frame is covered with upholstery to match that of the car.

Mechanical Flying GOOSE

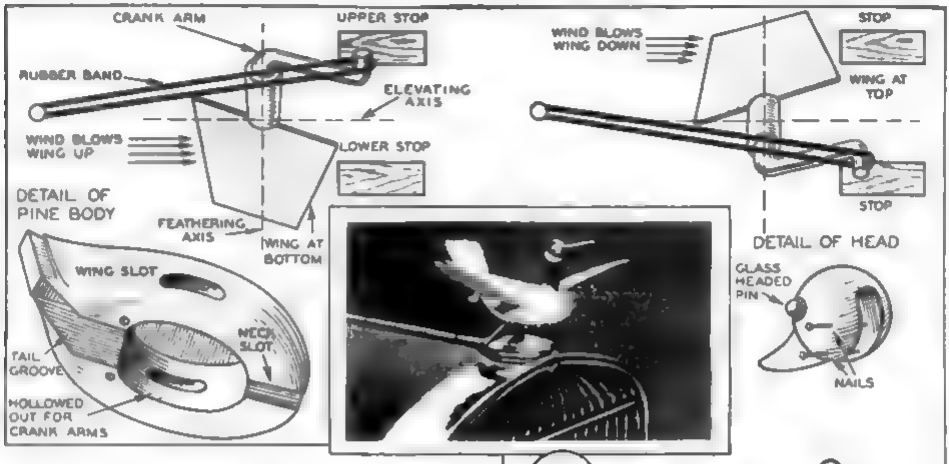


Fig. 1. Top drawings illustrate operation of the wings when struck by air currents. The pine body is shaped as shown in the lower drawing.

For novelty in radiator ornaments, you'll have to go a long way to beat this mechanical flying goose. As you speed along in your car, an ingenious arrangement of mechanism in the bird causes it to straighten out and flap its wings to simulate a real live goose in flight.

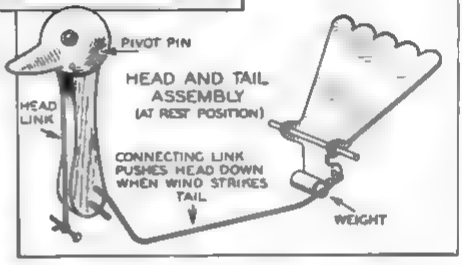


Fig. 2. Completed bird is mounted on radiator cap as shown in photo. Arrangement whereby head is lowered when wind strikes tail is given below.

WHILE your car is standing still this wild goose isn't so wild. He perches sedately upon the radiator cap surveying the world with a glassy eye. But as soon as you start up and shift into high he flattens out his tail, stretches his neck forward and begins to flap his wings as if he were going somewhere, and going there in a hurry.

There is not a staggering lot of work on this bird, but it is important that all moving parts operate freely. With the exception of small brass rod, a short piece of tubing to fit over it and some sheet duralumin or aluminum, all materials can be picked up in your work shop.

Start with the body. The original was made from a block of sugar pine 1½ in. thick, 2½ in. wide and 4¾ in. long. The general shape and inside carving is shown in the underside view in Fig. 1. In hollowing out the body an expansive bit, hack saw and chisel will do the work nicely. A certain amount of fitting will be necessary later when you install the mechanism of neck, wings and tail.

As the wings are first in importance, make and install them before the other parts. The phantom view, Fig. 3, shows how the wings are installed. Cut the wing plane or blade as per the squared diagram, Fig. 3, from sheet duralumin. Tin will do if you have not the lighter material, but it won't function as smoothly. On the underside secure a section of 3/32 in. brass rod by means of fine wires. You will not be able to solder to duralumin.

Now make a universal joint of a short section of brass tubing soldered to a piece of tin cut as indicated in Fig. 3 for the wing to operate in. This fits into the slot in the side of the body, and is fastened to it by means of the bent ends of the elevating axis driven into the wood.

The principle of operation of the flapping

Decorates RADIATOR CAP

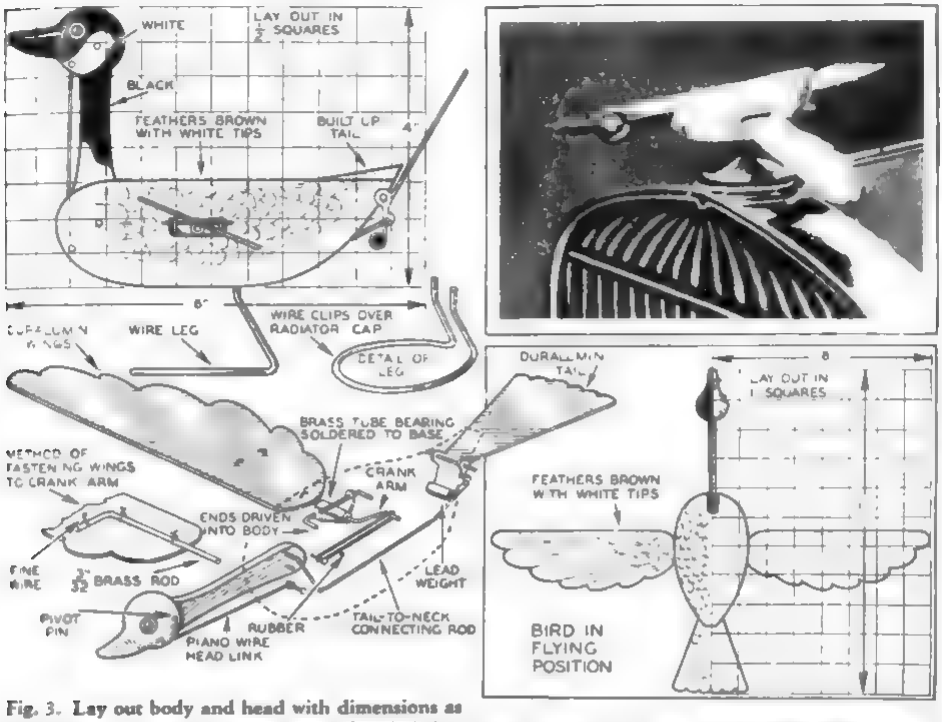


Fig. 3. Lay out body and head with dimensions as given in squared chart. Phantom view of body below shows manner in which universal joint on wing is attached to body. In upper photo you can see how bird appears while in "flight" on the radiator cap.

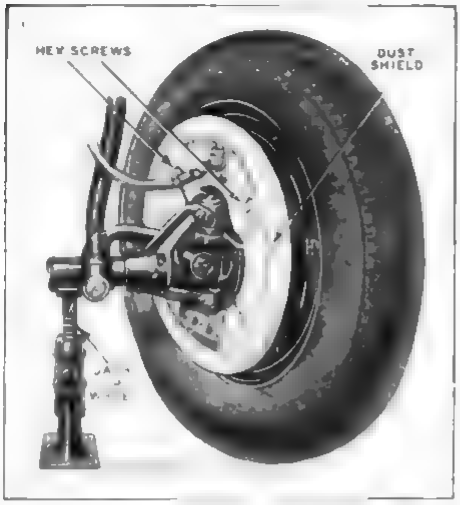
wing is known as "feathering," and is practically the same as the movements of a sculling oar used at the stern of a boat. This action is illustrated in Fig. 1. Note in the first position that the wing tip is down, but the leading edge is elevated. Thus the air current causes the wing tip to rise. When it reaches the top limit of the second position, or rather while approaching it, the crank arm inside the body is brought against a wood stop, which tilts the leading edge down, and thus the air current forces the wing tip down again. This flapping operation continues as long as there is a fair wind. The rubber band snaps the wing into proper position as soon as the crank-arm passes the center line.

It is necessary to have the brass rod, or crank-arm shaft, fit nicely in its tube bearing and also to have elevating axis work without much play. Tension of the rubber band will be determined by experiment, as will the location of the wood stops. Bind the rubber bands to the crank-pins with thread and apply model airplane cement also.

Tin will not do for the tail on account of its weight. So large an area must necessarily be above the axis that either duralumin or aluminum must be used. Even at that it must be counterbalanced with a good-sized piece of lead, for this weight must also keep the head erect when at rest, in spite of the fact that the latter, as well as the neck, is made of soft balsa. Added weight can be had by using a fairly heavy wire or brass rod for the connecting link, as illustrated in Fig. 2. It is necessary to swing this link low to clear the wing mechanism. Light piano wire is used for the link between head and body. This is a necessary feature, for otherwise the head would merely lop down in lifeless fashion when the neck is pushed forward. Loops in the piano wire are made by twisting two or three turns around a small nail driven

(Continued on page 200)

How to Adjust Brake Shoes to Give Normal Clearance



With the axle supported by a jack, leaving the wheel free of load, brakes are quickly adjusted.

IF TROUBLE is experienced with the brake pedal of hydraulic brake systems going too near the floor before braking action is secured, the first point to inspect when seeking the cause is the amount of clearance between the brake shoes and the brake drum.

In the late type of hydraulic brakes, having an automatic system of fluid replenishing in the master cylinder, it is possible to "pump" up the master cylinder and brake pedal so that it does hold. However, when the pedal pressure is released for a few minutes and the pedal again depressed, it will again come to the floor board.

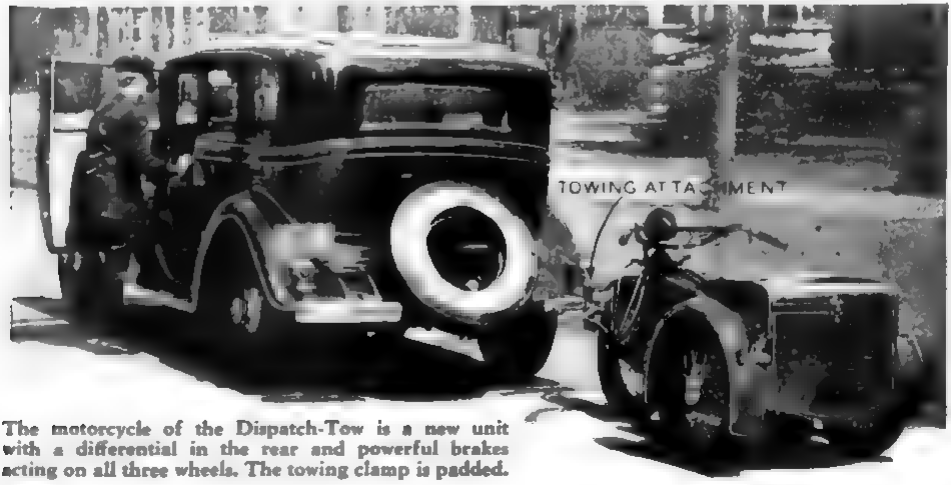
The prime reason for this particular action lies in the fact that the master cylinder does not hold enough fluid to fill the wheel cylinders and expand the brake shoes. The pumping action draws in and pumps in more fluid.

The trouble is cured by adjusting the brake shoes to normal clearance. The normal clearance on the internal expanding hydraulic brake shoe is .006" to .010", or what the mechanics term a "free running fit". The shoes are expanded by means of hex screws, as pointed out in the illustration, on the inside of the brake drum and dust shield rigging.

Have the axle supported by the jack, with the wheel free of load. Set one of these screws up until a slight drag is felt on the wheel, then back it off just enough to remove this drag. Next adjust the other screw until it shows a little drag on the spinning wheel and then back off to free.

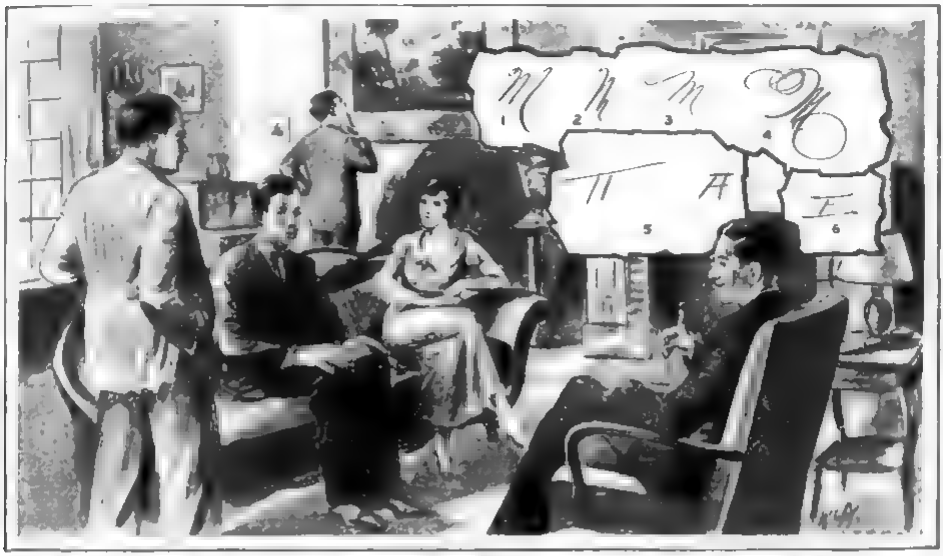
A Quicker Form of Auto Service

BY MEANS of a new invention, automobile dealers can now give better and quicker repair and retrieving service to owners. Through a new type of vehicle just introduced by one of the large motorcycle manufacturers, a quick one-man-method is presented of calling for and delivering customers' cars to be oiled, greased, serviced or stored, or for making quick roadside repairs after minor breakdowns. Usually a car with a driver and extra mechanic are required.



The motorcycle of the Dispatch-Tow is a new unit with a differential in the rear and powerful brakes acting on all three wheels. The towing clamp is padded.

Free Analysis of Your Handwriting



What do the capital letters of your handwriting tell about your character and abilities? Send a specimen of your writing to M. N. Bunker, care of Modern Mechanics and Inventions, for a free analysis. Specimens 1 to 4 above indicate self-consciousness, shyness, joviality, and stylishness respectively; 5 and 6, love of culture and ability in some phase of art.

M. N. BUNKER, an outstanding authority in the science of grapho-analysis, finds in his researches that capital letters have a peculiar value in revealing qualities of character. Take for instance, the capital M. Written as it is specimen No. 1 it shows a hidden strain of self-consciousness. This writer thinks that people are watching him, and he is afraid he will make a blunder of some kind. He hesitates to stand on his feet and talk and is very uncomfortable when attention is centered on him.

On the other hand the writer who makes his capital M as in No. 2 is self-effacing. He will prove in almost every case to be a "yes-yes" man and will be unassuming to the last degree.

The writer of No. 3, who starts his capital M off with a flourish is going to see the sunny side of things. It is not because he is such an optimist, but because he has an ever present sense of humor. He likes to laugh rather than grouch.

However if your writer makes many curves and turns at the beginning of his M or W, and makes crude and heavy down strokes as in specimen 4, you may look for a man who will wear a neck-tie with wide bars and go to extremes in fashion. He will choose foods too rich, and unless he is engaged in very active physical labor, will suffer from indigestion.

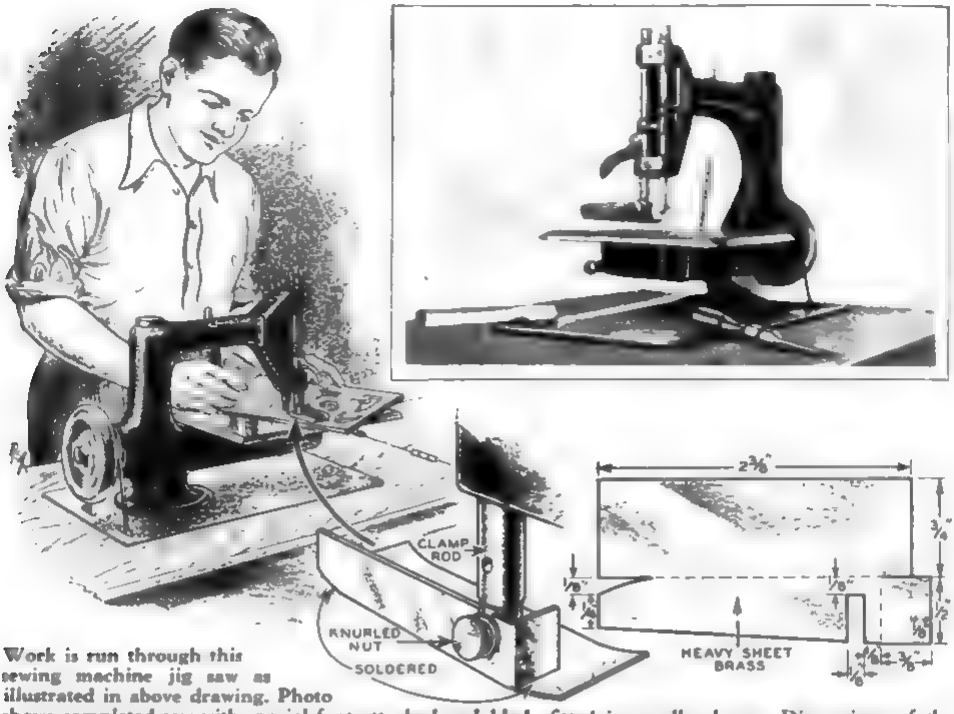
Other capital letters tell just as much about character. An N or A made as in No. 5 will give evidence of artistic ability, and an E made like a printed capital E is indicative of a love of books and culture.

It is in the capital letters that the forger very frequently makes his greatest effort to copy a signature, and for this reason the capital letter will be more nearly true in a forgery than will any other part of such a signature.

At the same time the extra effort that he puts into making the capital letter will trip him up, because the average writer does not give any more attention to making the capital letters in his name than in writing the rest of his signature.

Your latent powers and talents, as revealed by your handwriting, will be analyzed for you free if you will send a stamped, self-addressed envelope, together with a specimen of your handwriting, to M. N. Bunker, care of Modern Mechanics and Inventions, 529 So. 7th St., Minneapolis, Minn.

Jig Saw Made from Sewing Machine



Work is run through this sewing machine jig saw as illustrated in above drawing. Photo shows completed saw with special foot attached and blade fitted in needle clamp. Dimensions of the special foot which replaces cloth sewing foot are given at right. Note method of attachment to rod.

THERE are many times in the course of one's work that a jig saw would come in handy, but because of the prohibitive cost of the saw and the motor the average workshop fan has to do without and get along as best he can. However, if you can lay hands on an old discarded sewing machine in some junk yard you can easily devise a serviceable little jig saw that will do all that a factory built machine will do.

You will find it necessary to remove the feed and bobbin mechanism and turn the little round piece the needle goes through so the saw can be inserted and have a back rest to keep it from bending when the work is held against it. The oscillating rod that holds the needle should be raised so that it will take a thicker piece of work. This can be done by removing the end plate, loosening the clamp around the rod and setting both the clamp and rod as high as they will go without hitting anything. Both sides of the wing screw that holds the needle should be ground off so the rod can be set a little higher.

The blade, which is to be one-eighth inch wide, must be cut from a regular coping saw blade long enough to extend through the saw table at all times. One end should be ground to fit the needle clamp so that it cuts on the down stroke. The foot which holds the cloth down should be replaced by a larger one made of heavy brass, plans for which are shown above. In treadling, the saw runs smoothest with the heel of one foot on the front of the treadle and the toe of the other on the back. Anything up to one quarter of an inch can be cut rapidly, though a piece seven sixteenths of an inch will go somewhat slower. Different makes of machines vary in construction, but with a little ingenuity any of them can be converted into a saw.

When running work through the saw, be careful not to apply too much pressure, as the blade has no support at the bottom. The blade should be kept well oiled at all times for smoothest running and neatest cutting. While foot power may be used, a motor will speed up sawing jobs considerably.

Things to Make with Tools

Edited by A. NEELY HALL

Can You Solve this Sliding Block Puzzle?

NINE blocks of wood and a shallow wooden tray form a puzzle that will give you and your friends no end of fun. Construction of the puzzle is a matter of minutes if you possess the average assortment of tools.

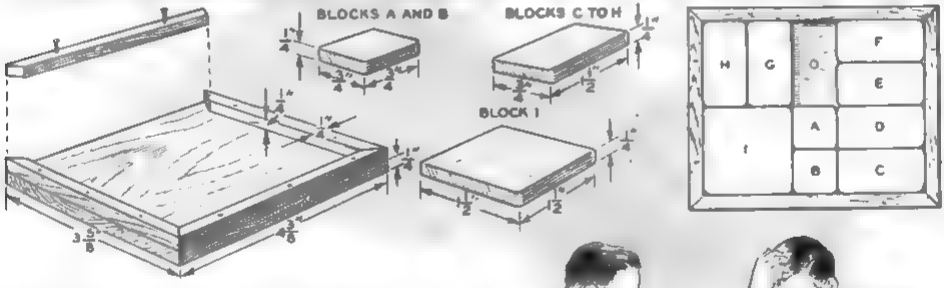
The tray is made by fastening, with brads or glue, ¼"x¼" strips around the edges of a ¼"x3⅝"x4⅜" piece of wood. This forms an enclosed space measuring 3⅛"x3⅞". In this space are nine wood blocks each ¼" thick. There are six oblong pieces measuring ¾"x1½", two small squares ¾"x¾", and one large square measuring 1½"x1½".

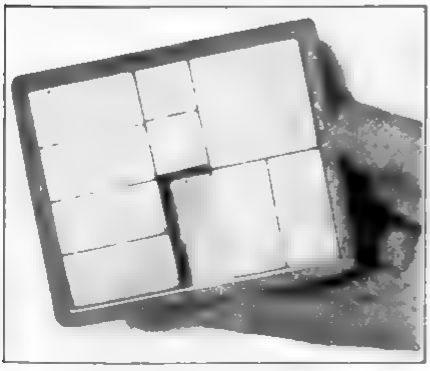
The pieces are arranged in the tray as illustrated in the drawing below. Letter the blocks and the spaces in which they fit as shown in the drawing. Mark the vacant space "O". The object in working the puzzle is to move the large square from its present corner to the upper right hand corner by sliding the various pieces about.

To work out the puzzle make the following moves:

Blocks A and B to O; I to AB, H to I, G to H, A to lower G, F to GO, E to F, AB to E, I to GOIA, C to IB, D to C, AB to D, E to F, F to E, I to GO, AB to IA, D to D, C to C, AB to IB, I to IAGO, F to GO, E to F, D to E, C to D, AB to C, I to ABI, E to GO, D to F, C to E, A to D, I to ABCD, G to I, FE to HG, DC to OFE, AB to FE, and I to DC.

You will find that this solution requires about 36 moves, and that the puzzle, in spite of its apparent simplicity, has a way of reversing itself and leading you astray.





Tray and blocks of the sliding block puzzle are cut to dimensions given in the above drawings. All blocks and the vacant space are marked with letters shown to aid in solution. Object of the puzzle is to move large block "I" up into space occupied by blocks "F" and "E". A simple key to the solution of the puzzle is given in the text.

Sturdy Target and Easel

Here is the target and easel set up on the range.

IF YOU are provided with a strong sturdy bow and a quantity of straight lithe arrows, such as were described in plans given in this department last month, you are now ready to complete your archery equipment by building this target and easel. In case you missed out on these plans a copy of July MODERN MECHANICS AND INVENTIONS will be forwarded to you upon receipt of 25 cents.

The photograph and drawings above show a standard sized archery target measuring 48 inches in diameter. Smaller targets are in use, but it is supposed that you will want this tournament size. There is only a little more work to making it. Rye straw makes the firmest target mat so get it if you can. Also, buy a ball of strong tarred twine, an upholsterer's needle, enough burlap to make a cover, and a piece of oilcloth 54 inches square for the target face.

To start the mat, prepare a straw rope 4 inches in diameter, like that shown in Figure 1. Bunch the straw and press it together to make it very compact. Then bind it every 6 inches or so with the tarred twine. With several yards of rope prepared, roll the end into a tight button, as shown, and form a tight coil around this. Thread the upholsterer's needle with the tarred twine and baste the turns of rope together. When you have reached the end of the rope, prepare another length of several yards and splice it onto the first length. Continue the coil, binding the

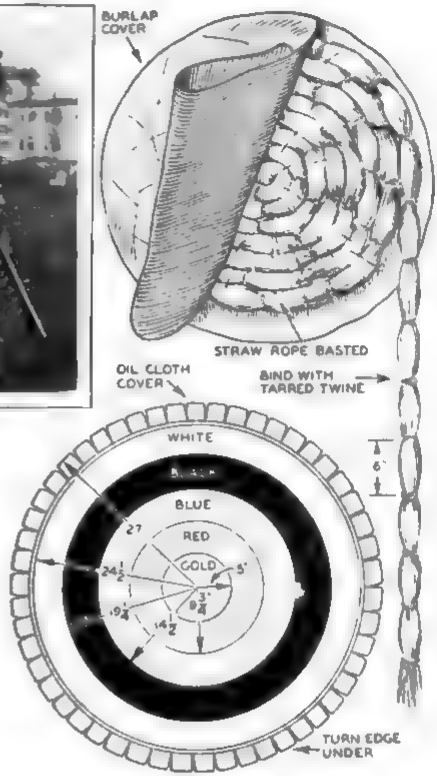


Fig. 1. The straw rope which forms the mat is bound with tarred twine and basted to burlap cover as illustrated here. Drawing below shows radii of rings to be inscribed on oil cloth cover.

turns firmly together, and splicing additional lengths onto the rope as needed, until a mat 48 inches in diameter has been formed. Then go over the job and reinforce every turn with additional stitches of twine.

When you have completed the mat, make a cover for it out of burlap. Cut two circular pieces of burlap 54 inches in diameter. Spread one piece upon the floor, place the mat upon it, and then spread the second piece over the mat. Bring the edges together and sew them, taking pains to smooth out wrinkles on the front and back surfaces. Run stitches through the burlap and straw, as indicated in Figure 1. A tight fitting cover makes a firmer mat, and keeps broken bits of straw from dropping out of it.

for Archery Tournaments

Here's a sturdy tournament size archery target that will stand a lot of severe punishment. When you have constructed it, get busy on the easel, and you will be ready for some target practice that will make you an expert marksman with a bow and arrow.

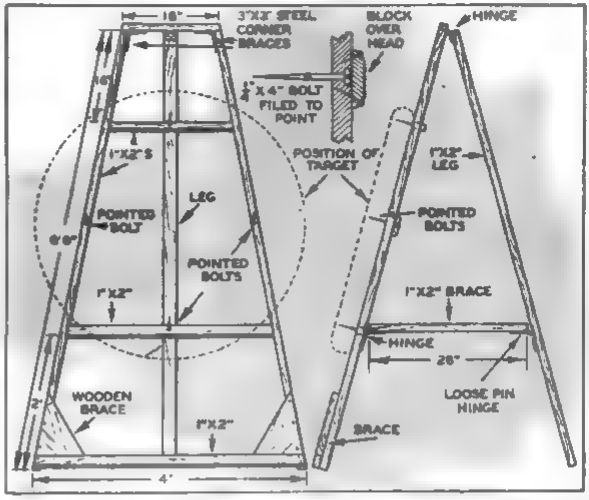


Fig. 2. Plans for construction of the easel. Note that top is hinged for folding when not in use. The target is held in place by means of 4 inch bolts filed to point and stuck in straw. Center brace holds target firm.

A piece of white table oil cloth 4½ feet square is of just the right size for the target face. Figure 1 shows the radii to use for describing the target rings. A strip of heavy cardboard with a pin stuck through it near one end, and holes punched at correct distances apart in which to insert a pencil, makes a good compass. Spread out the oilcloth upon the floor, locate its center, and describe the circles.

Fill in the bullseye with gold radiator bronze, and the rings with enamel paint of the colors marked upon the diagram. The narrow green band forms a border. It is called the "petticoat". It may be omitted, often is, but it trims up the edge. When you have painted the target, cut off the oilcloth on the 27-inch circle, and slash the edge as far as the petticoat, making the slashes about 2 inches apart. Turn this slashed edge under for reinforcement.

Place the target face upon the mat, and baste it to the burlap cover, with stitches about 2 inches apart.

You can knock out a substantial easel like that shown in the photograph quickly. It is built of 1-by-2 stock. Assemble the front frame as shown in Figure 2. Cut the side legs 6 feet 6 inches long, and spread their ends the distances apart indicated. Trim off the upper ends so that the top rail will fit squarely. Nail the bottom rail across the face of the legs, and trim off its ends flush with the legs. Cut the intermediate rails to fit at the points indicated. Brace the frame with a pair of 3-by-3 steel corner braces screwed inside the upper corners, and a pair of triangular blocks nailed across the lower corners.

Make the rear easel leg from a strip of the same length as the front legs. Hinge it to the center of the top rail of the front frame. Cut a strip 28 inches long for the horizontal brace, and hinge it to the lower intermediate rail of the front frame, and to the rear leg, as shown in Figure 2. Use a loose-pin hinge for one of these hinges, and attach a short length of chain to the head of the pin and to a screweye in the leg to keep the pin from being lost when it is removed from the hinges.

For pins to support the target buy four ¼-inch bolts 5 inches long and file their ends to points as shown in the drawing. Drive the bolts into holes bored through the front frame at the points indicated. Countersink their heads and nail blocks of wood over them as shown, to hold them in the holes.

Finish the target easel with a coat of shellac or lacquer.

After a number of punctures from bull's-eyes have been inflicted on the target, you may have to re-cover the face with a second sheet of oil cloth like the first. If you do not want to do this you can paste small patches over the holes and paint them to match the color of the ring.

Toboggans on Pine Needles

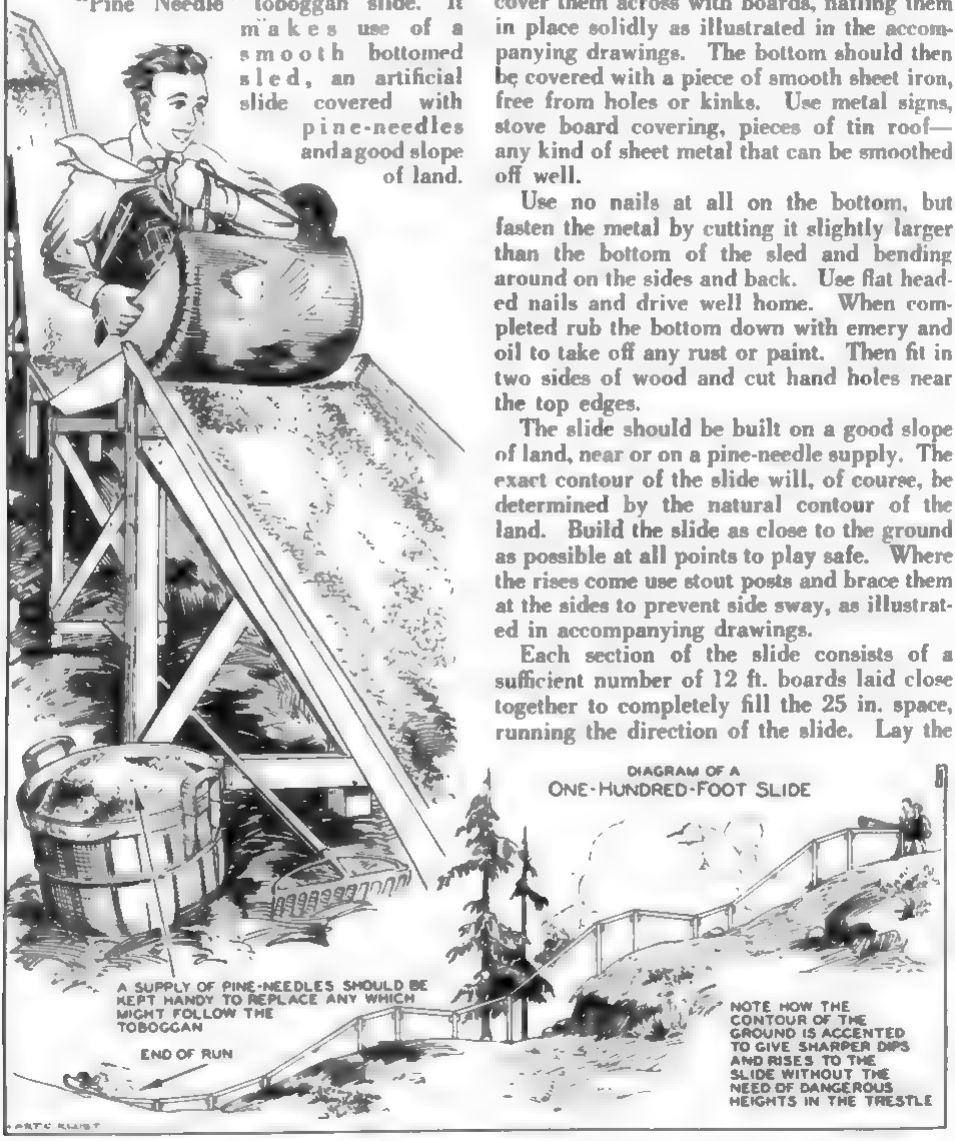
THOSE who have wandered in the woods know how difficult it is to walk up a slope covered with pine-needles. Some have even slid down such slopes, when young, on a barrel stave, which was lots of fun. Just such an idea is embodied in this "Pine Needle" toboggan slide. It makes use of a smooth bottomed sled, an artificial slide covered with pine-needles and a good slope of land.

The sled is the first part of this affair to construct. It is built upon two light timbers curved up in front and about 4 ft. long. These timbers can be admirably matched by two old buggy shafts. Remove all iron work and fastenings so the wood is clear. Then cover them across with boards, nailing them in place solidly as illustrated in the accompanying drawings. The bottom should then be covered with a piece of smooth sheet iron, free from holes or kinks. Use metal signs, stove board covering, pieces of tin roof—any kind of sheet metal that can be smoothed off well.

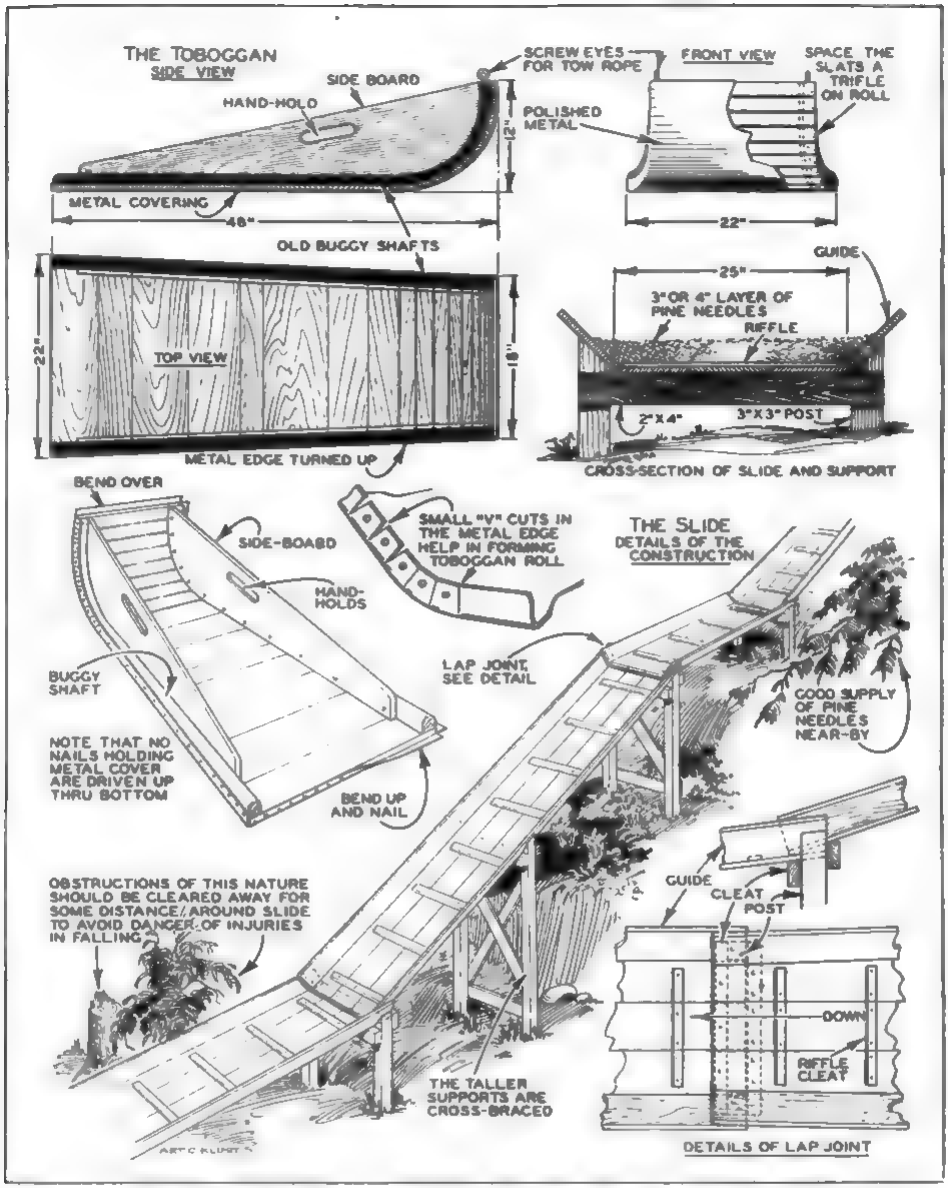
Use no nails at all on the bottom, but fasten the metal by cutting it slightly larger than the bottom of the sled and bending around on the sides and back. Use flat headed nails and drive well home. When completed rub the bottom down with emery and oil to take off any rust or paint. Then fit in two sides of wood and cut hand holes near the top edges.

The slide should be built on a good slope of land, near or on a pine-needle supply. The exact contour of the slide will, of course, be determined by the natural contour of the land. Build the slide as close to the ground as possible at all points to play safe. Where the rises come use stout posts and brace them at the sides to prevent side sway, as illustrated in accompanying drawings.

Each section of the slide consists of a sufficient number of 12 ft. boards laid close together to completely fill the 25 in. space, running the direction of the slide. Lay the



A hill that has gradual slopes with sharp dips and rises should be selected for erection of the slide.



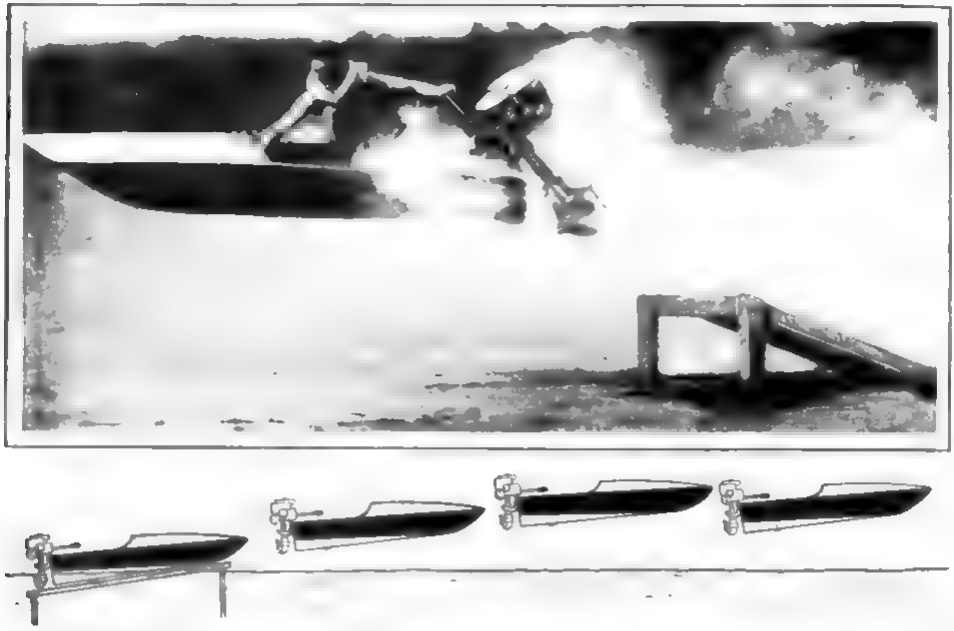
Above drawings give details for construction of slide, supports and toboggan. Bolts and spikes are used in assembly of slide and laps are made in direction of motion of the sled to avoid obstructions.

boards at the bottom of the slide first, working back towards the take-off. Nail cross pieces 18 in. apart across the boards to serve as riffles which hold the pine-needles in place.

The side boards consist of wide boards nailed to the bevels of the posts, their ends lapping in the direction of the sled's motion. Fill the slide from top to bottom with a three or four inch layer of dry pine-needles. Mat them down by walking on them and see that they are well distributed. Take the sled to the take-off and get aboard. Grab the hand holds and shove off. Away you go!

The more you use the sled the smoother the bottom will become.

Speed Boats Leap from Safety



Catapulting outboard hydroplanes from inclined skidways provides intense, but sometimes dangerous, thrills. The sketch above shows how special keel lifts boat vertically in air for flat landing on water.

by **DICK COLE**

Here's a special keel for your hydroplane that will insure safe landings when you catapult your boat from an inclined skidway. Tapered to meet the platform squarely, the keel shoots your craft vertically through the air so that it lights flat on the water.

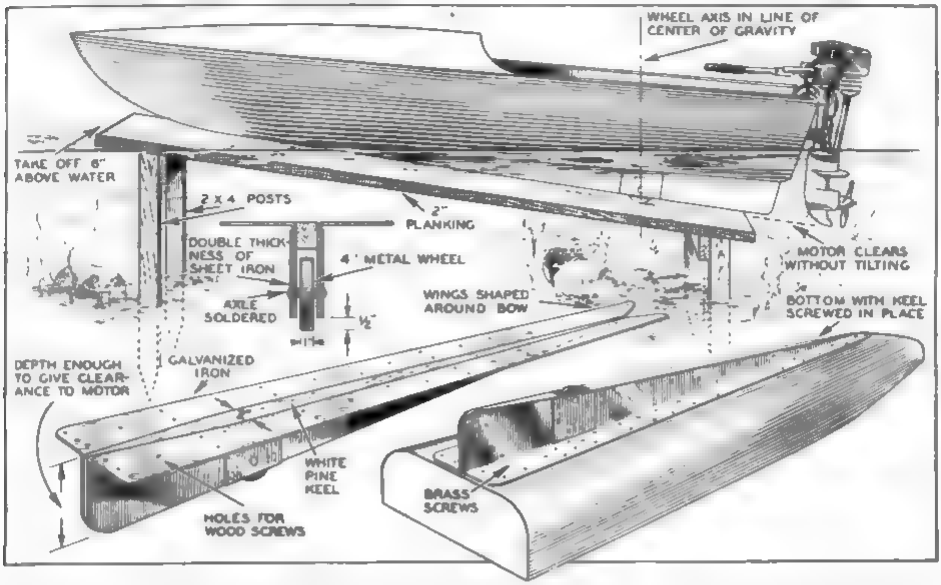
CATAPULTING an outboard hydroplane from an inclined skidway is quite a common practice nowadays among water sports enthusiasts. The usual skidway consists of merely an inclined, greased platform rising from the water. The boat dashes towards this at a speed of thirty to forty miles an hour, slides up the skidway and over the take-off edge, soars through the air and alights on the water again—sometimes not bottom down. With the ordinary skidway, the motor must be tilted to make the jump, and the behavior of the boat varies with different speeds, different designs, and different centers of gravity. At too slow speed, the boat may take a nose dive; at too high speed the boat may land on its tail.

All these catastrophes can be avoided, and "leaping putt-putts" made safe for the amateur, by constructing a special, tapering keel for the boat as is shown in the accompanying sketches. The purpose of this keel is to bring together two inclined surfaces—the keel and the take-off platform—so that the boat is *lifted* vertically, rather than simply diverted upward, as is the case with the common skidway. In the latter case, a horizontal plane meets an inclined plane, and the direction is merely diverted. The boat leaves the skidway in a different manner at different speeds. Accidents sometimes result, particularly to the motor.

The tapering keel shown in the accompanying drawings permits sensational jumps to be made from nearly a water-level take-off. And, in addition, the motor need not be tilted. It can deliver its power right up to the moment of take-off.

A simple skidway can be made as shown

Skidway on SPECIAL KEEL



These drawings show construction of skidway and special tapering keel. Note wheel located at center of gravity. This keel meets skidway squarely and makes motor tilting unnecessary, as illustrated at top.

in the sketch of the job at the top of the page. Four 2"x4"'s, with pointed ends, are driven into the bottom at a place where the water is from four to six feet deep. In tidal water, or in lakes with variable water-level, a floating skidway is best. This can be made with barrels or pontoons. The correct incline for the skidway can best be determined after the keel is fitted to the boat and tried out. The angle of incline of the skidway should be the same, inversely, as the angle formed by the waterline and the bottom of the keel. The two planes then come together as true inclined planes.

The construction of the keel is shown in the sketches. This design, with minor variation, will be adaptable to almost any boat. First a wooden keel is made. This tapers from flush position at the bow to the depth of the "heel" of the motor at the stern. A very thin, knife-edge keel would be best and would offer the least resistance. But this can not be readily constructed to afford sufficient strength, so the wooden keel is widened out near the stern and then streamlined to cut down the resistance. After the wooden keel is formed, it is covered with heavy sheet galvanized iron with flaps which permit it to be screwed to the bottom of the boat. The drawings, with notations, clearly explain this construction.

Before the keel is put permanently in place, the center-line of gravity should be determined. with the motor attached and a passenger in his usual position in the boat. This can be found by moving a block of wood under the keel until a point is found where the boat balances. A metal wheel is set in the keel at this point. A metal wheel about 4" in diameter and with a one-inch face will serve. The axle of the wheel should be soldered to the galvanized iron so that the wheel turns on the axle. It should protrude about ½" below the bottom of the keel. The drawing explains details.

A boat fitted like this is practically frictionless when in contact with the skidway. Regardless of the speed, the boat will always rise horizontally and alight the same way. Additional speed makes the jump higher and broader. Since the rear end of the keel is a little lower than the heel of the motor, it is not necessary to tilt the motor for the jump. However, the motor should be throttled down the moment the propeller leaves the water, or damage may result.

Full Wing and Fuselage Dimensions Are Given in Three-View Drawing

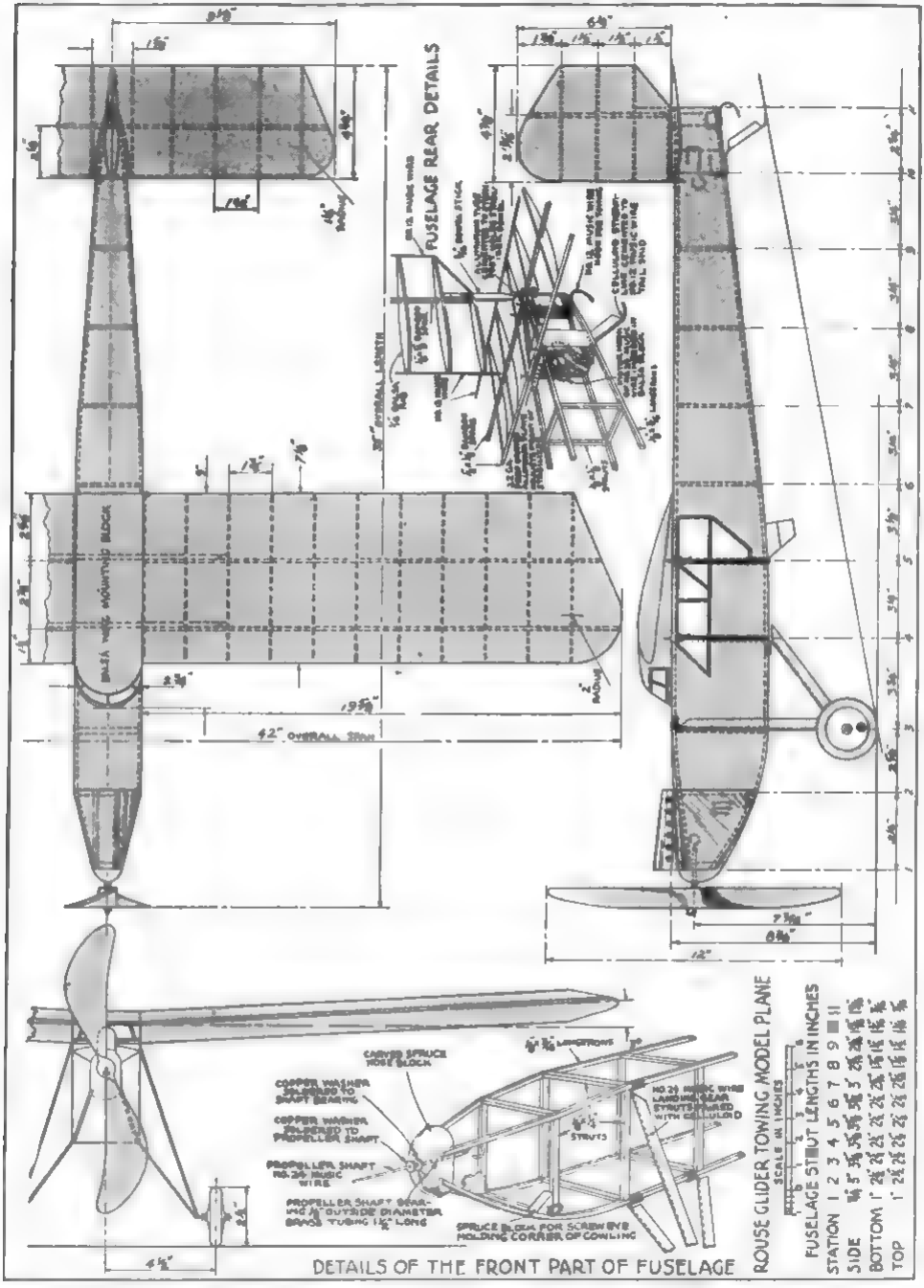


Figure 1. A three-view working drawing of the Rouse glider towing model plane. These drawings give all the important dimensions and illustrate the more intricate details. Other dimensions and full instructions will be found in the text. Particular attention should be given to the propeller design.

Stewart Rouse, the "Flying Artist" and author of this article, proves that the stunt will work.

Model Plane Tows Glider

by **STEWART ROUSE**

One of aviation's greatest feats is Captain Hawks' flight from San Diego to New York in a glider towed by an airplane; and one of the biggest thrills that can come to model fans is to build and successfully fly a model glider towed by a model plane. And the best part of it is that either model will perform nicely when flown independently.

IT IS quite possible to tow a model glider with a model airplane if care is taken in construction and flying. Very long flights cannot be expected, but when a good flight is obtained it is very pleasing, as the tow string drops off and the glider stays up long after the plane has landed.

Fig. 3 will give you an excellent idea of the glider's construction. Starting with the fuselage, first draw a pattern of its side view on a board and outline this pattern with small nails to form a jig in which to place the 1/8" square balsa wood longerons and struts during the assembly of the side panels. Make the joints with ambroid cement and where necessary a neat wrapping of thread and glue may be used.

When the two side panels are complete, and the cement has hardened, remove them from the jig and install the top and bottom struts as shown. At this point note that the horizontal and vertical struts at station 11 are of 1/8"x1/2" balsa and that the rear ends of the longerons are cemented at station 12 in notches carved in a solid block of balsa wood used as a stern block. This block is carved from a piece of 3/4"x7/8"x 1 1/2" in size. The front ends of the longerons are cut to hold a nose strut of 1/8"x1/4" balsa wood to which they are wrapped with glue coated thread. Triangular balsa filler blocks cemented in the angles of the longerons behind this nose strut add stiffness to the joint. A reinforcing stringer of 1/16"x-1/8" balsa wood is fastened on each side of the fuselage. A tow hook of .030 music wire is fastened to the lower end of the nose strut with a wrap of thread and cement and a tail skid of the same size wire is inserted in a hole through the stern block to which it is strongly cemented.

The landing gear is made of two pieces

Fig. 2. With these airfoil patterns of plane and glider, the ribs will be easy.

of .030 music wire held with a wrapping of thread and cement to bottom horizontal struts 4 and 5 and the bottom longerons. The ends of the rear wire bend down and out to form axles while the ends of the front wire merely bend down and are soldered to the rear wires near the stub axles to form two "Vees". Before soldering, the wires should be bound together with a few turns of fine steel wire. Two tiny brass wheel retaining washers soldered on the axle keep each wheel spaced. The wheels are either turned from wood to an exact imitation of airplane wheels or they can each be made of a pair of button molds glued together with a thin copper washer cemented on each side to serve as a bearing.

The wing is built in two halves joined together at the center with a mounting block carved from solid balsa wood. There are two 1/8"x3/8" balsa spars in each wing and the outline is of 1/16" square bamboo. Fig. 2 shows the Glenn Martin 20 wing section used as a rib pattern. Using this pattern the ribs are cut from 1/16" sheet balsa wood. The three shorter wing tip ribs are carefully drawn inside this pattern to get the true wing section at the tip. Use a safety razor blade for cutting the ribs.

The wing should be assembled in a jig similar to the one used for the fuselage panels. The ribs are slipped on the spars like beads on a string and cemented in place. The outline of bamboo is fastened with thread and cement. Bend the bamboo while heating it cautiously over a candle flame. Carve the wing mounting block from a piece of solid balsa as shown in the wing attachment details drawing of Fig. 3, providing the light turtle back fairing attached to its front made of 1/16"x1/8" stringers with their rear ends glued in notches in the wing mounting block and their front ends in notches in the edge of a small semi-circular bulkhead of 1/16" sheet balsa. Two 3/16" dowels are glued in holes through the block with their pointed ends protruding 1¾". 2⅛" aluminum tubes of 3/16" inside diameter are fastened with thread and cement to the rear faces of the spars, at an angle of 3° to the tops of the spars. When the dowels are inserted into them the wings and the wing mounting block become a unit. Two pieces of .030 music wire are thrust through holes in the wing mounting block as shown and their protruding ends made into 3/16" loops to hold the ends of two 1/8" rubber bands which hold the mounting block firmly to the fuselage top while allowing easy fore-and-aft adjustment of the wing. The turtle-back in front of the cockpit is made of 1/16" x1/2" balsa stringers and another 1/16" balsa bulkhead.

The vertical stabilizer has two 1/8"x1/8" balsa spars, ribs of 1/16" sheet balsa and a tip and trailing edge of 1/16" square bamboo. The master rib, that is the longest, is 4 3/16" long and is 1/2" deep at its deepest point, 1½" from its leading edge. By examining the top view in Fig. 3 it can be seen that the vertical stabilizer ribs are of streamline section. Pointed 3/16" dowel sticks are fastened with thread and cement to the rear faces of the spars of the vertical stabilizer. These are inserted into two 3/16" inside diameter aluminum tubes fastened in the rear end of the fuselage. The forward tube is held to the rear faces of the horizontal struts of station 11 with threads and glue, and the rear tube is cemented in a groove cut in the front of the solid balsa stern block.

The horizontal stabilizer is very similar to the vertical stabilizer. Its single 1/8"x-3/16" balsa spar serves as its leading edge, while its trailing edge is of 1/16" square bamboo. Its ribs are cut from 1/16" sheet balsa and are rather unusual in that they are flat on top and curved on the bottom. The master rib is 4" long and is 5/8" deep at its deepest point, 1. 1/4" from its leading edge. A deep notch is cut in the rear of the balsa fuselage and the leading edge of the horizontal stabilizer is cemented securely therein.

Building the Tow Plane

After building the glider the power plane should present no great difficulty. The longerons, however, have to have their front 4" boiled, set in a jig, and dried to give the angular bends at station 2 which are necessary to keep the longerons straight

Many Important Details Clearly Shown in Working Drawing of Glider

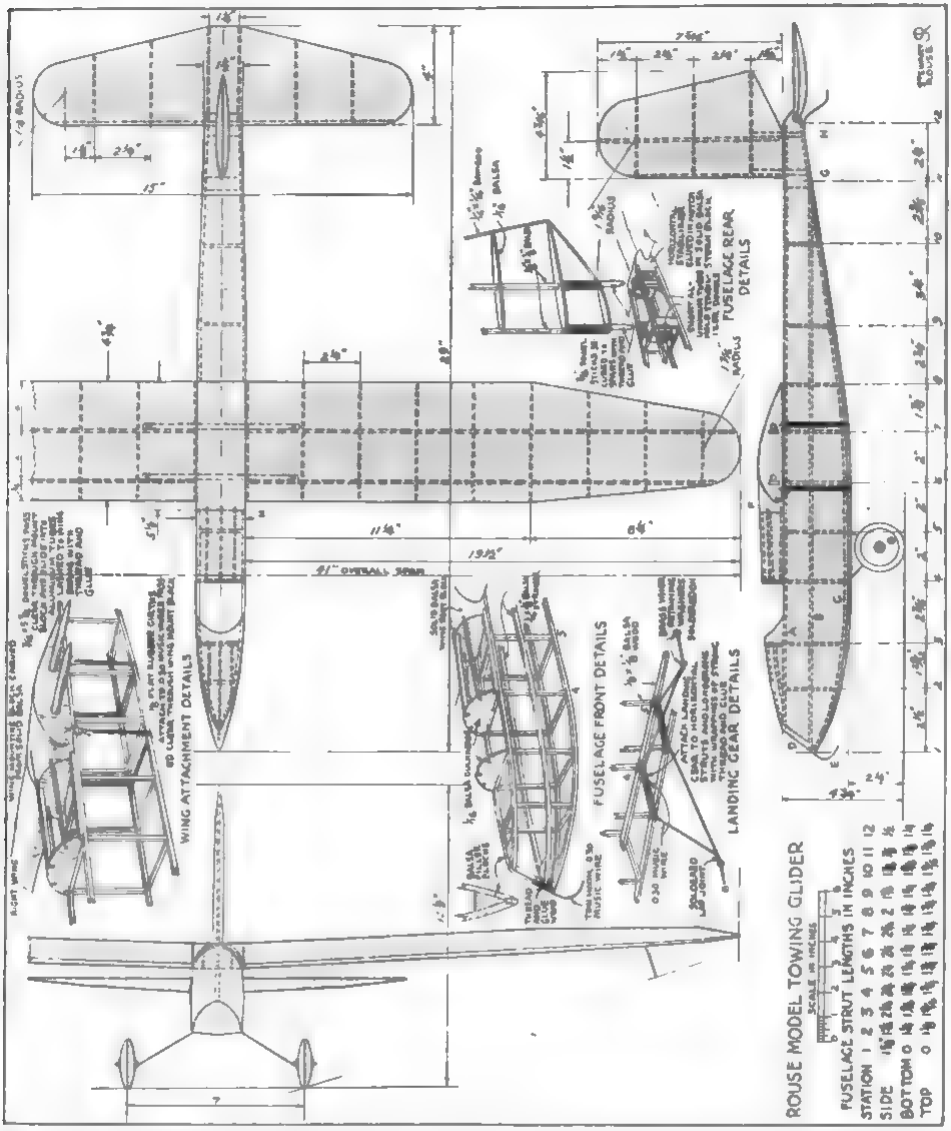


Fig. 3. This three-view working drawing of the Rouse model towing glider shows important dimensions.

between stations 1 and 2, so that the metal cowling will fit.

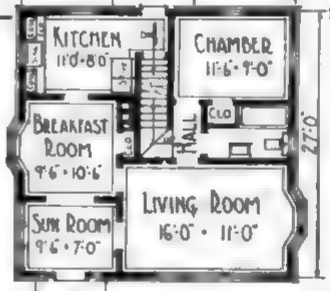
The longerons are of 1/8"x3/16" spruce set with the 3/16" dimension vertical. Struts are of 1/8"x3/16" spruce. Station 10 is a solid block of balsa holding a motor hook of No. 24 music wire. After passing through the hole in the block the wire is bent over and driven back into the block to prevent the hook's turning. On each side the wire passes through a washer cemented to the block and the wire is soldered to these.

A tail skid of No. 12 music wire faired with a doubled strip of celluloid cemented on is also securely hooked into and cemented to the station 10 balsa block. Station 11

(Continued on page 190)

If You're Short on

Built from plans No. 6-W-60, this seven-room all-lumber house utilizes all modern time, material and labor-saving methods of construction.

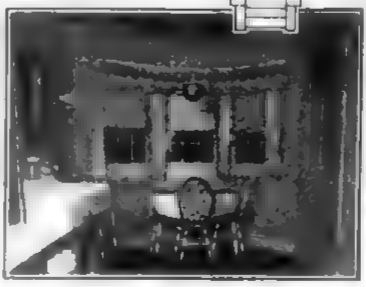


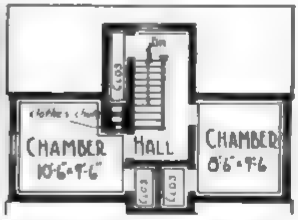
Floor plans for house No. 6-W-60. Blueprints can be had by sending $1.00 to Modern Mechanics Home Building Editor, Minneapolis.

by MAURICE I. FLAGG

Protected by "style insurance," these two houses will prove most economical in the long run, for built in ever-popular colonial style, they have high resale value.

HERE are the figures, $3675.02, even to a split nickel, that it cost to build the Colonial story and one half bungalow above, Plan No. 6-W-60. Better news than the seemingly low price for a seven room house is the fact that it was built two years ago when building costs were considerably higher than today.





Above—second floor plans. Left—Oriel window in breakfast room is stock item, adding decorative feature.

There was no skimping anywhere, just careful planning by a practical builder to prove how a little money can bring big returns if the plan is compact and advantage taken of stock materials. The price included everything: heating, plumbing, insulation, millwork, a full basement and sound construction throughout. But it did not include the lot.

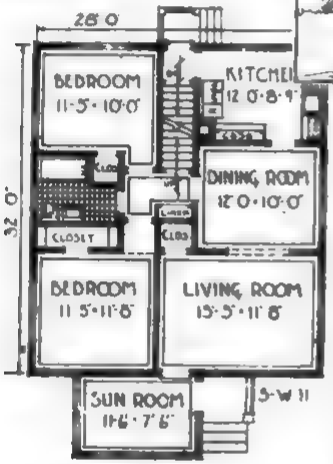
A two car garage 18′ by 18′ was added

CASH Build These

HOW TO GET A BLUEPRINT AND TWO PLAN BOOKS

A one-sheet blueprint of any house appearing in Modern Mechanics magazine may be had for $1.00, postage prepaid. Two new plan books, HOMES FOR NEWLYWEDS, containing 32 of the latest ideas for low cost homes in all styles, and 16 SELECTED HOMES FOR LEAN PURSES containing time, space, and labor-saving bungalows, may be had for 15 cents each, or both books for 25 cents, postage prepaid. Address Home Building Editor, Modern Mechanics Magazine, Minneapolis, Minn., for blueprints and plan books.

One of the most popular bungalows ever designed—plan No. 5-W-11. With two bedrooms on first floor, a dining room, kitchen, and sun porch, the house proves extremely practical and has high resale value. Left—first floor plan for house No. 5-W-11. Construction is of wood, with shingle side walls.



· FIRST FLOOR PLAN ·

Construction costs of this house are cut to a minimum by use of stock materials, which save both time and labor.

later for around $300. The final cost for house and garage was $3,975.02. The house was built in a city of average size and considering today's rock bottom material prices it should be duplicated in most any community outside the larger cities for about the same amount of money, perhaps less.

Let's see what the owner got for his money. In the first place there are five rooms on the ground floor or complete bungalow service; a large living room, breakfast room, bath, kitchen, bedroom and sunroom. Two bedrooms on the second floor may be finished later if you are intent on saving money at the start.

Nineteen windows on the first floor make the house almost a glorified sunporch flooded with light, ventilation and fresh air. Notice how cleverly stairs have been placed in the rear, thus permitting a larger living room on the front of the house and no waste space and no extra expense for a staircase. Sun porch, breakfast room and kitchen open into each other in such a way as to make the interior appear larger than it really is. While there is no fireplace, representing a saving of perhaps $250, the space it would occupy in the living room has been turned into a Colonial bay window. All floors are hardwood except the kitchen, which is linoleum. Plumbing is modern and the bath tub recessed.

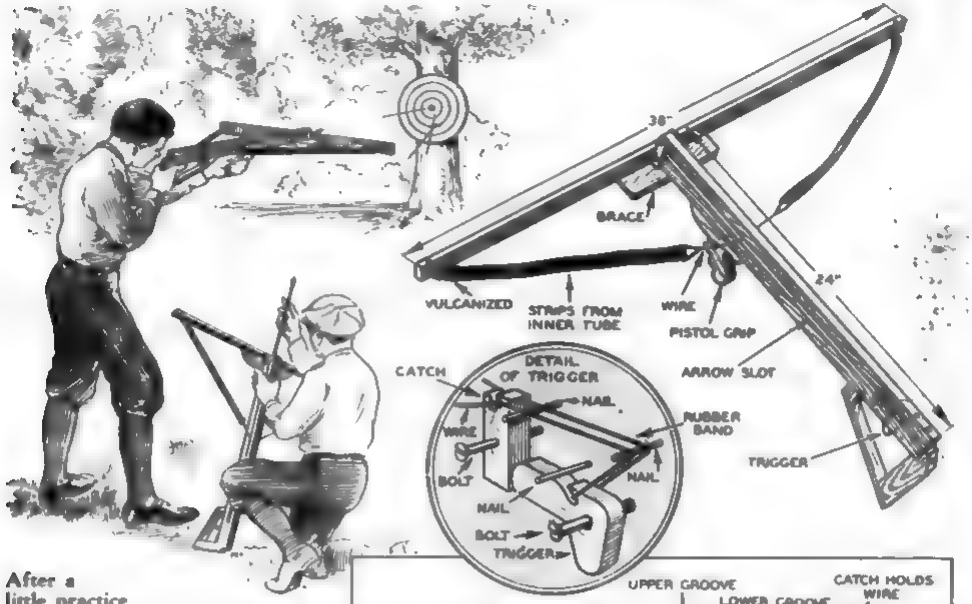
Opening off the stair landing leading to the second floor is a spacious clothes closet. A clothes chute from second floor hall to basement is another feature. All bedrooms have good closets.

The bungalow is a lumber house throughout which, according to builders, requires the least initial cash outlay. Exterior walls are siding painted white, roof is red cedar edge grain shingles, base course is brick, entrance door a stock pattern with overhanging hood. Blinds add the finishing touch of usefulness as well as decoration. Don't omit them.

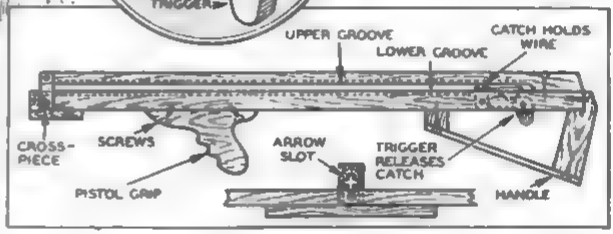
Considering the outside dimensions of 27′ by 27′ you'll find this plan as compact and at the same time as large in equipment and service as can be placed within so small an area. The fact that it is a

(Continued on page 189)

Long Range Crossbow fired by Rubber Band



After a little practice with this modern crossbow you can become an expert marksman and bag small game in hunting trips afield. The drawing above shows how to load and fire the bow.



Parts for crossbow are shaped and assembled as shown in these drawings. Note the special arrangement of trigger in inset.

THE favorite and most effective weapon of fighting men in the days before the advent of the rifle was the crossbow. Armed with these deadly instruments, the archers were greatly feared by their enemy, for they could bring down their man at a great distance. These crossbows are easily made, and with a little practice, you can become an expert marksman on the range or in the hunting field.

Construction of a strong, accurate bow requires only a few scrap pieces of wood, an inner tube rubber band, a short length of wire and a few wood screws. The motive power which drives the arrow is furnished by the pair of rubber bands, each fourteen inches long and an inch and a half in width. The bands should be scraped clean at the ends and lap vulcanized, as you would a tire. Then it is easy to slip in the fence wire, which is attached to the crosspiece as illustrated in the accompanying drawings.

The frame, or what amounts to the barrel, should be made from two pieces of wood about 1½"x2"x24", with grooves cut on the inner edges to serve as the bore for the arrow. The trigger, shown in detail in the accompanying drawing, is the most novel feature of the bow. Grooves must be cut in the barrel pieces to take the trigger and release, which lets go of the wire when the trigger is pulled. Care should be taken in locating the pivot bolts, as successful operation depends largely on the correct adjustment of the two pieces.

To modernize your cross-bow provide it with a pistol grip as illustrated, and add the stock on the end for the shoulder brace. Finally sandpaper the barrel and stain the completed bow.

Arrows fired with this crossbow can be the customary arrows used in standard archery tackle, though slightly shorter. In loading the crossbow, pull back on the wire, hook it in the trigger catch, then insert the arrow in the barrel as demonstrated in the drawing above.

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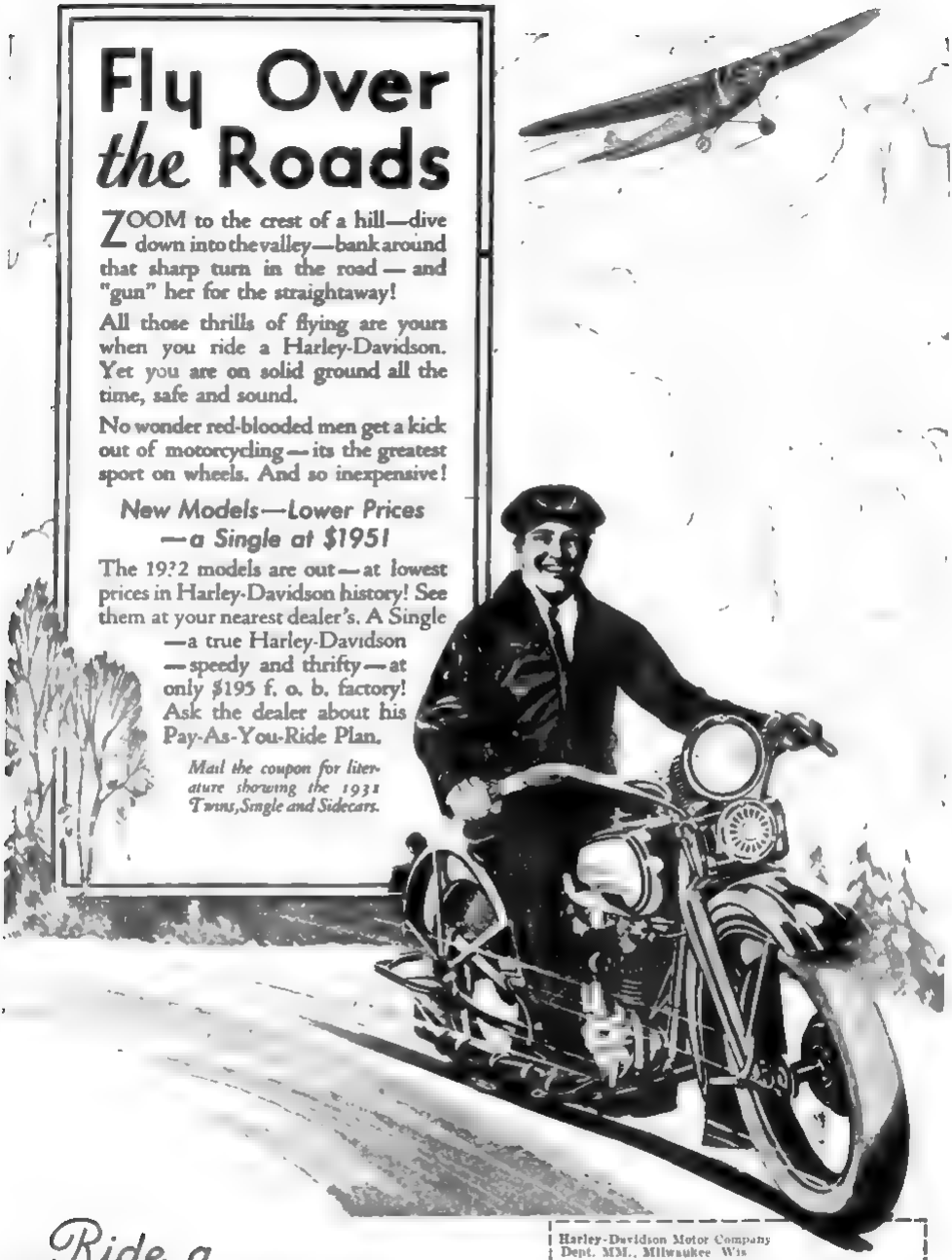

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AGE 18 and UP

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This picture, posed by Robert B. Snyder, Jr., of Maryland, gives an idea of how the fan-like spread of his shoulders adds to his appearance—and here is a way in which you may start your muscles to such a point of development.

The muscles that make up the "fan-like" spread are easily put into use, but unless they are loosened up, you will lose time. When going to bed at night or getting up in the morning, reach back and work the muscles under and back of your arm. Tense them, bringing these muscles out as much as possible, and then gripping the outstanding muscle, work it loose. Do not pull nor bruise but massage this part of the back and shoulder so that the muscle will stand out more and more each day.

This seems improbable but it is true. If you work this muscle loose you will find an actual increase in the "fan-spread" within a few days. At the same time the muscle itself will grow stronger if you will use any of these stunts.

Chinning yourself is one of the finest ways in the world to work up the muscles to make a good "fan-spread". Go about it to see how many times a day you can chin yourself—and do not skip days, and make excuses. Chin yourself more times each day. Run a competition with yourself, and be a winner every time.

(Continued on page 182)

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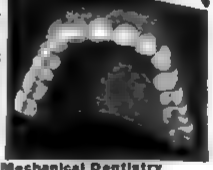

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Strengthen Your Shoulders!

(Continued from page 180)

Lie full length on the floor; support your weight with your arms and hands, with your toes. Slowly raise and lower your body, bringing the body up as much as possible, and then slowly going back to the floor. This is good for the arms, but it gives the back muscles work that increases their thickness and strength so that when you can spread them, they will be much more massive.

FREE—a beautifully illustrated lesson which shows a number of strong man stunts and how to do them. You may have one by sending a stamped addressed envelope to David V. Rush, care of Modern Mechanics and Inventions, 529 South Seventh St., Minneapolis, Minn. Five dollars will be paid for the most interesting strong man stunt sent in by a reader during the month, accompanied by a photo.

Amazing Warship of the Sky

(Continued from page 46)

control car and crew's quarters to warm them.

Another new thing about the *Akron* is that it is the first airship to be built independently of the beef steak and roast beef consumption of the country. In the past the gas cells of a Zeppelin have been lined with goldbeaters skin, a thin gas tight material taken from the intestines of steers, and in a ship the size of the new air giant it would take millions of steers to provide the vast quantity of skin required to line the twelve huge gas cells.

But we have developed at Akron a new gelatine-latex process by which a gelatine coating is attached to the gas cell fabric by a rubber latex binder, the material being evenly spread by mechanical means. With the old method each small piece of skin, rarely larger than a square foot had to be cemented in place and rolled down by hand, which made gas cell building a slow and costly process. The new cells are not only practically as light as skin lined bags, but cost less and, tests have indicated, will stand up better under handling, particularly in cold weather, when skin-lined cells are quite fragile.

Many people have the idea, because airship building in America has been devel-

oped by a rubber company, that the fabric covering of a Zeppelin is a rubberized cloth. It is not. Putting the covering on the ZRS-4 is very much like covering an airplane. The same sort of cloth is used, the panels, stretching from rib to rib and from transverse girder to girder, are laced in place, the joints covered with tape, and the cloth is then "doped" with a cellulose dope to shrink and stiffen it. After several coats of dope the surface is lightly sandpapered to make it smooth, and a final coat, in which is mixed aluminum powders, added. The final coating of metallic paint increases the waterproofing, and also turns back most of the sun's rays—which is important as heat expands and wastes the lifting gas.

In connection with waterproofing, much has been printed in the newspapers of late regarding the possibility that rain soaked up by the hull covering or adhering to its surface may have been responsible for the tragic loss of the R-100 a few months ago. It is possible that moisture had something to do with that disaster, but not in that way. Investigation shows that a film of water one one-hundredth of an inch thick, covering as much as 80% of the ship's surface, would not have weighed more than six tons, that the impact force of falling rain on the R-100 could not have struck a total blow in excess of 300 pounds, and that total saturation of the fabric could not increase its weight more than six percent over its weight when perfectly dry. As there is no such thing as dry fabric in normal practice at least one-fourth of this latter item would already be taken into account in planning the ship.

It is possible, as Dr. Eckener has pointed out, that the gas cell lining may have failed because the cement used was not moisture proof, that water may have entered in quantities through bow openings, and that in a violent effort to lift the ship's nose tears in the forward gas cells may have been ex-

(Continued on page 184)

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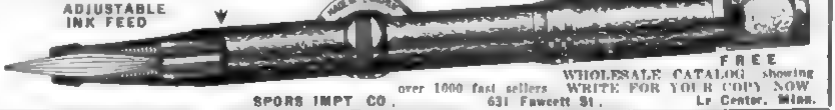

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Amazing Warship of the Sky

(Continued from page 183)

panded into great rents. The loss of the British ship, it seems certain, was primarily due to novel features of her construction, the previously untried gas cell cement, and the political conditions which dictated her fatal trip under unfavorable circumstances.

Two companies, the Pacific Zeppelin and the International, have been organized to investigate and plan regular commercial air lines across the Atlantic and Pacific oceans. In planning the construction hangar for the navy ships we built it large enough to house the construction of thousand foot, ten million cubic foot capacity commercial liners. That size is rather larger than will be needed, perhaps. Somewhere between six and eight million cubic feet may be the ideal size for hundred passenger commercial ships, equipped with all the luxuries of an ocean liner, plus the absence from noise, vibration and seasickness, and with the great speed which only the air can offer.

With four to six such ships regular air service could be maintained on an economical basis, spreading all the overhead cost of terminals, ground crews, traffic department and other expenses over the operation of the entire fleet, instead of making one ship bear it, as has been the case with the *Graf Zeppelin*. That would mean appreciably lower rates for passengers and freight, no higher, perhaps, considering the speed and other advantages, than those charged on the crack ocean liners. The measures pending before congress providing for air mail contracts on trans-oceanic routes will, if they pass, remove one great obstacle in the way of the creation of such a superairship line, and make the early inauguration of such a service almost a certainty.

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Ten Billion-Dollar Inventions

(Continued from page 53)

be far too fanciful to be included in the general list.

A cheaper and more simple system or process for the fixation of atmospheric nitrogen was considered and accepted to the list on the pleas of the chemists present. What is needed is a simple nitrogen fixer that a farmer can purchase and operate himself with power received from the electric light company. Such a device would do a great deal to make farm land more valuable and help farmers out of their present difficulties. Naturally the apparatus needed should not cost much and it should be capable of producing at least one hundred pounds of fertilizer a day. Furthermore, the fertilizer should cost but a fraction of a cent a pound if the invention is going to be of maximum usefulness.

There are in various parts of the world, particularly South America, countless billions of tons of low grade coal; that is, coal with a very high degree of ash. What is needed is a cheap and effective way of removing this ash so this coal may be used near the spots where it is found. Naturally, this invention would not benefit the United States, but it would offer very great industrial stimulation to the South American countries and in this way it would affect the United States.

Television must go on the list. It still awaits that crowning discovery that will bring it out of the laboratory and place it at the disposal of the workaday world. Much remains to be done and the inventor who can master the situation will eventually find himself many times a millionaire. To say that once developed television will develop into a billion dollar industry is by no means a fanciful prediction.

A rather interesting debate fixed the position of the ninth invention. Both of the chemists and the electrical engineer kept the floor and after listening to their arguments, the rest agreed that the vast importance of their invention entitled it to be placed among the great ten. It was that of controlling rain; something that man has desired for many centuries. Artificial precipitation has been caused to a minor extent by permitting charged sand to fall from an airplane but the system offered no promise. What is needed is a system reliable enough to be turned over to the city

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Ten Billion-Dollar Inventions

street cleaning department so that rain may be turned on at three o'clock in the morning and off again at four. And if we can control rain there is no reason to suppose that we cannot control snow, inasmuch as rain is only frozen snow. To be able to control snow storms and blizzards, to say nothing of cloudbursts, would be of enormous value when we stop to think of the many millions of dollars damage every year. Incidentally, it was agreed upon that the system needed to effect this control would be electrical—really a means of controlling the charges in the atmosphere. The system should not involve the use of supervoltages owing to the great difficulty of controlling such voltages.

And what is the tenth great idea? Perpetual motion? No, the idea of perpetual motion was not even considered, although

(Continued on page 188)

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Ten Billion-Dollar Inventions

(Continued from page 187)

the one non-technical member of the group, the business man, did mention the subject. Perpetual motion is never mentioned as a possibility by men who have won their technical spurs, so to speak. They know that it is utterly impossible. Anything that would nullify the law of the conservation of energy is impossible. Although many men have gone mad trying to batter this immutable law down it still stands just as solidly as ever, and perpetual motion is no nearer solution than it was hundreds of years ago when the idea was first conceived.

Rapid transportation through the medium of electro-magnetic levitation was finally awarded the tenth place. It was argued, and rightly so, that civilization is becoming too centralized, too crowded into large cities. Human health is being sacrificed at too great a pace. Neurosis is becoming a too common ailment. All of this centralization is brought about by the necessity of business and social intercourse. Rapid transportation at low cost would solve that. The New York business man could commute from the Adirondacks if he could travel 400 miles per hour. The airplane is as yet neither fast enough or safe enough for him to use. A car levitated electro-magnetically would function as a sort of airplane under perfect control and near the earth. It would overcome to a large extent that great bugaboo of travel, friction. Furthermore, it is possible that such a car could be made to reach prodigious speeds with safety.

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Build These Houses

(Continued from page 177)

square house means economy in construction. A word about the style. Colonial never grows old, at least in style. And style is a highly important consideration if you want to protect your investment. Many houses shrink 25% and more in resale value when a style passes. Not so with Colonial. Its popularity is proven. The style, time tested.

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Income-minded builders like this plan because the front bedroom can be rented. A door placed between the bedroom and sun porch will permit a tenant to enter the house without disturbing the family.

What about the cost? In round numbers, $5,000, and perhaps less under present market conditions. Costs vary depending upon location and equipment. If you wish to save money you may be able to do with a partial basement. You may live where basements are not necessary. That would save $350 and more. You can finish the second floor at some future time. That would help on initial expense.

Both of these houses have been built and tested for service. Both look well and wear well. The chief reason their price range is low is because they are built from stock materials obtainable direct from the dealer with no added expense for made-to-order millwork and finish. Which is true economy because it saves time and labor. And in these days when economy is the watchword and most of us have both eyes on income and outgo any plan and construction that keeps cost down deserves careful study and consideration. You have two such plans in this issue. Hope you like them.

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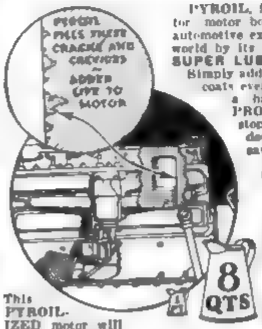

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Model Plane Tows Glider

(Continued from page 175)

is a strut carved from a piece of spruce 3/8"x1/2"x1 1/16". It is provided at its bottom with a hook of No. 12 music wire securely hooked and cemented into it. In a deep groove in its rear face is fastened with thread and cement a piece of 3/16" inside diameter aluminum tubing to receive the pointed dowel stick of the spar of the vertical stabilizer.

The front ends of the longerons are set in notches in a nose block carved of solid spruce. A propeller shaft bearing is made of standard 1/8" outside diameter brass tubing 1 1/2" long. 1/8" from the front end of this bearing is soldered a copper washer to prevent the bearing from sliding through the nose block. The propeller shaft is of No. 24 music wire and has a thrust bearing in the form of a copper washer soldered to it. This propeller shaft is passed through the bearing tube of the nose block and is bent into a hook for the rubber motor.

The landing gear is about the same as the glider's except that it has an extra strut on each side running from near the wheel to the top longeron.

The motor cowling is made of 28 ga. sheet aluminum. A piece of the aluminum is given five bends, set on the fuselage nose, adjusted carefully, marked for cutting with a pencil and trimmed with a pair of scissors to size. A 1/8" flange is bent along the bottom longeron. A small screw eye is installed in a spruce block cemented to the bottom longeron on each side at station 2. This serves as a cowling corner fastener when passed through a small slot in the cowling and given a half turn.

The propeller is carved from a piece of basswood 7/8"x1 1/2"x12". Its shape can be seen in Fig. 1. The hub diameter is 1/2". A wire hook is driven into the hub which cooperates with the end of the shaft which is flattened and bent at right angles, so that when the power is expanded the propeller slides back a little on its shaft and spins freely with little wind resistance allowing the model to make a much longer glide.

The motor should be 26 strands of 1/8" flat rubber draped loosely over the motor hooks. The front end of the skein of rubber must be provided with a small "S" hook for attachment to the winder. Rubber tubing is slipped over the hooks to

protect the strands and glycerin is used sparingly for lubricant. To wind, have a companion hold the stem of the model while you take off the nose cowl and pull the rubber out through the side between stations 1 and 2.

The wing is simple. The ribs are cut from 1/16" balsa to the Clark Y wing section shown in Fig. 2. The spars are of 1/8"-x3/8" spruce and the entire outline is of 1/16" square bamboo. The wing mounting block is exactly like that of the glider except that it is of a different shape and size. Its front is carved to look like a pilot's cabin and the hollow front glazed with celluloid cemented on.

The wings are set at a 3° dihedral and a 5° angle of incidence.

The vertical stabilizer is of streamline section. It has an outline of No. 12 music wire, 1/16" balsa ribs and a 1/8"x1/8" bamboo spar. A 3/16" dowel stick is used to fasten this rear spar to the aluminum tube of the stern post while the front of the stabilizer can be adjusted for turning the ship, by setting the lower end of the leading edge wire in any one of a row of holes in a perforated 22 ga. aluminum strip cemented to the top longerons in front of the leading edge of the horizontal stabilizer. The vertical stabilizer ribs are 4 7/8" long, of streamline shape, and are 1/2" deep at their deepest point 1 1/2" from the leading edge.

The horizontal stabilizer is a true wing but as in the case of the glider it lifts downward. Its ribs are 4 3/4" long, and are 3/8" at their deepest point 1 1/8" from the leading edge. The horizontal stabilizer has two 1/8"x1/8" bamboo spars which lie flat on the top longerons where they are secured with twists of light steel wire binding them to the longerons. The rear spar of the horizontal stabilizer is cemented in notches in the ribs.

The models should be covered with fine Japanese rice paper. Cut the paper oversize and proceed slowly and carefully only putting on glue a little way ahead and carefully removing all wrinkles as you go. When the models are covered give the glider two coats of airplane dope cut half with high grade lacquer thinner, and give

(Continued on page 193)

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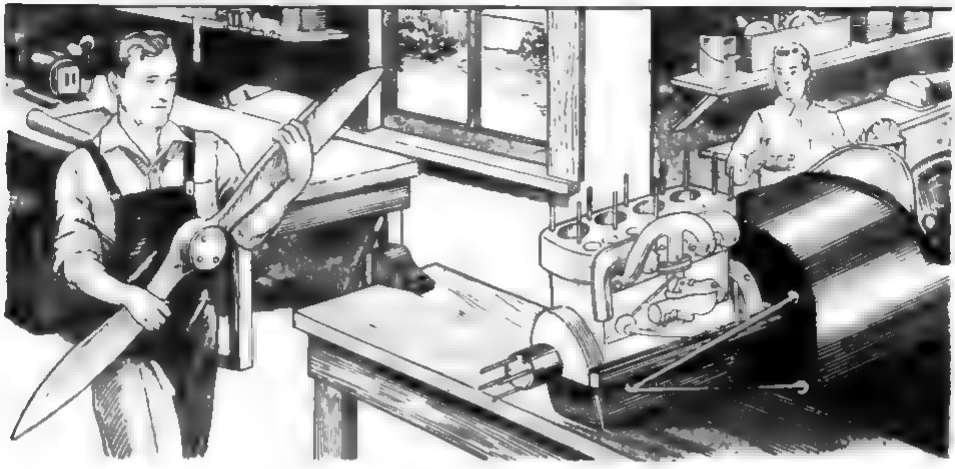

WITH a few simple tools such as hammer, chisel, saw and drills, and perhaps a portable welding outfit, you can fit yourself out with a neat workshop in the garage or barn where you can build that dream plane of yours. You'll find the complete plans, with working drawings and photographs, of America's most popular light planes and gliders in the 1931 edition of the

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A Flying Model Sailplane, and scores of others.

Look for This Cover

Model Plane Tows Glider

(Continued from page 191)

the tow plane three coats, as it is a stronger structure. The old reliable aluminum paint is probably best for a finish coat as it makes defects less noticeable. The imitation window frames of the cabin monoplane can be painted with black paint or India ink.

For a tow cable use a 20 foot piece of strong linen thread with a small wire ring on each end for the tow hooks. A 10" length of light rubber band will serve well as a shock absorber, and will keep the tow line from falling off too easily.

Set the models on the runway with the tow line tight, release the power model, and if the models are well adjusted, the power model will sail away with the glider in tow.

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Showing how notes may be made while driving.

hold a pad of paper or maps by means of a strong steel clip.

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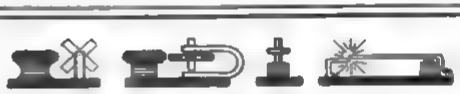

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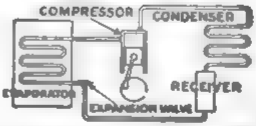

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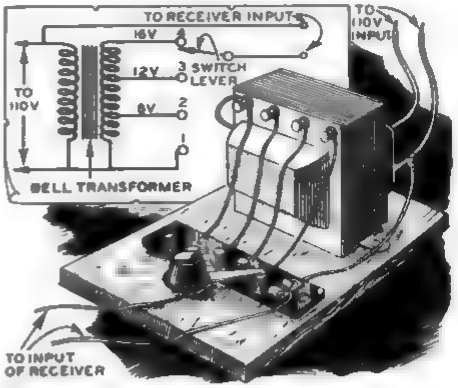
Tapped 50-75 Watt Bell Transformer Regulates Line Voltage for Receiver

FOR AC receivers not equipped with line voltage regulators, the subnormal voltages encountered on the AC line become a nuisance. This situation can be remedied by using a 50 or 75 watt bell ringing transformer with two or three voltage outputs to boost the subnormal line voltages.

Fasten the transformer to a baseboard on which has been mounted a lever switch and four contact points, as illustrated at the right. Solder leads to the input wires, running one to the receiver input and the other to the first switch point. Then hook the output taps to the contacts and connect the switch to the receiver input. Switching to various taps will bring the voltage up to normal.



Volt regulator is mounted and wired as shown.

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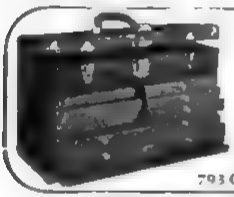

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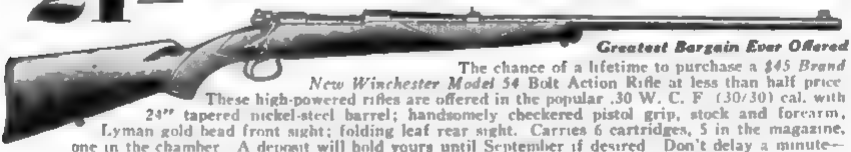

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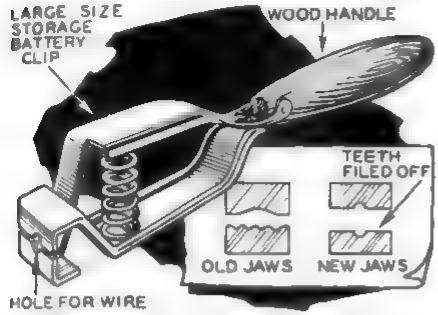
Wire Skinner From Battery Clip



The teeth of the battery clip are filed off and a hole bored in the jaw as shown. The jaws are clamped over the insulation to be skinned.

IN BUILDING radio sets or doing some experimenting you need some sort of tool for skinning the insulation from wire. Such a tool can be easily made from an old spring battery clip as shown in the drawing above.

Use one of the heavy type clips with strong jaws. File down the teeth of the jaws until a straight surface is produced. Then with the jaws clamped together in their natural position drill a hole through their junction as suggested above. Make it just slightly larger than the diameter of the wire to be skinned; that is, the bare wire itself. Then fit a suitable handle to the back of the clip as shown.

To use the skinner, insert the wire in the hole and clamp the jaws down on the insulation, then pull back smartly.

Largest Radio for Waldorf-Astoria

THE new Waldorf-Astoria hotel, in New York, will have the most costly and complicated radio broadcast receiver in the world. Costing around $200,000, the apparatus will furnish six different radio broadcast channels to each of the 2,039 guest rooms. A switching arrangement in each of the rooms will enable the guest to pick out any of the six different programs being transmitted.

The dynamic speakers with which each room is equipped are simply plugged into a wall outlet.

Don't Ride the Clutch

THE act of keeping the foot on the automobile clutch pedal, even with a light pressure, is known as "riding the clutch." This simple act, ofttimes an unconscious one on the part of the car driver, is certain to result in trouble after a time. If nothing worse results, a noisy clutch throw-out collar is almost certain to occur. The more serious phases of this unconscious act are a slipping clutch, a clutch which will grab, one with worn out clutch facings and a clutch collar worn out so that it must be replaced.

The design of the clutch has much to do with its life. However, no clutch is designed to be operated with the clutch pedal partly depressed. The driver should form the habit of removing his foot entirely from the clutch pedal when he is not using it. If it is desirous to keep the toe in close contact with the pedal, only so much pressure should be allowed to come on the pedal as will allow it to remain in its fully retracted position, otherwise wear and trouble are certain to occur. There is ordinarily about one inch of pedal movement before actual retraction of the clutch parts is started.

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Outfitting Explorers for Adventure

(Continued from page 156)

"The polar voyager also gets chocolate bars, tea and coffee. The latter two, of course, without milk or cream. The exploring world is no place for one addicted to a love for luxuries, though exploring itself is the most luxurious of sports.

"Dried fruit and nuts are very conspicuous parts of any explorer's diet, whether he goes to the hot or cold regions. Walnuts have 3,200 calories to the pound; almonds, 2,140; dates, 1,420; figs, 1,440; prunes, 223; and raisins, 180.

"Bacon, having 1,053 calories to the pound, and ham, 832, are packed into every explorer's outfit. The jungle explorer gets condensed milk. Like his comrade who goes into the colder belts, he has bouillon for his soup to be made on the spot, if water is available.

"As far as bread and butter are concerned, they're completely out. Although I have had some explorers ask me to put pancake flour into their stores, and I have known them to make pancakes in the African jungle as well as on the Byrd expedition to Little America. Hardtack takes the place of bread, with 1,346 calories to 12 ounces.

"Every expedition, regardless of destination, takes a large quantity of candles. Another important item is the can-opener. I recall one traveling troupe, exploring de luxe with large quantities of canned goods, found itself far away without a single can-opener.

"The food and accessories are stored in fibre cases, which weigh one-third as much as wooden boxes, and these are packed in waterproof boxes which are stored in burlap. The reason for this secure system of packing is to prevent the natives of the jungle from stealing the contents or from the raids of wild animals.

"In the way of equipment, the explorer to distant lands first thinks of self-defense and self-preservation. This problem is solved with a supply of firearms and ammunition. Pistols and rifles fill the bill here.

"Sleep, just as in the case of every human being after a hard day's activity, is tremendously vital to the roamer in the wilds. The sleeping-bag is the safest and most comfortable bed which the explorer knows. I have invented a number of sleeping-bags, each

Outfitting Explorers for Adventure

type suitable to the particular region being explored.

"I have equipped a number of exploring and hunting parties for North China and British Columbia with one type of sleeping-bag, and I have had another kind for mountain-climbing parties.

"The Fiala sleeping-bag which is used by explorers was invented by me back in the days of the Ziegler expedition. But my first design was of fur, and fur is too warm to use in more temperate climates.

"It is now made of pure long fibre wool, which is warm and light, equaling in warmth about 15 pounds of ordinary blankets. The bag is widest at the shoulders, tapers toward the foot and is fitted with a complete hood. Flaps are sewed on at each side and are so placed that they can be drawn across the chest and tucked over the shoulders. One inside bag is sufficient for ordinary weather, but two can be used in extreme weather.

"By way of shelter for the adventurer in the tropics I have them take along a tropical tent which is also one of my inventions. It is a ventilated tent, insect and reptile proof. This is made of so-called waterproof equatorial tent cloth with a six-inch sill and sewed-in floor of brown canvas. It has additional cheesecloth walls and front and rear entrance-ways with draw-string openings. The outside walls are of the equatorial tent cloth. When these walls are rolled up, the occupants of the tent are protected by the inner walls of cheesecloth.

"On the other hand, I have a more rigid piece of equipment for the polar venturer. It is called the Fiala parka, resembling a mackinaw with a hood. Sir Hubert Wilkins liked one I made for him so much for his trip to the South Pole that he came in one day and had me make a special parka for him to take to the North Pole regions on his submarine trip. The parka is usually made of lightweight canvas cloth or closely-woven all wool mackinaw cloth.

"Aside from the equipment I have already mentioned, and I might say that one item is just as important as the other and just as indispensable, I am often called upon to supply sledges and dogs. Even ships. Of course wooden ships are far superior in go-

(Continued on page 198)

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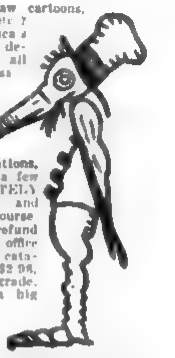

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Outfitting Explorers for Adventure

(Continued from page 197)

ing to the icelands because of their flexibility when caught fast in the ice.

"Commander Byrd's vessel, you will recall, was of wood for that very reason. As most of the equipment which Byrd carried on his last expedition was contributed by persons financially established to do so, I did not play such a great part in aiding him in the preliminary preparations, I am sorry to say. However, I did fit him and his men out with snow goggles, special Arctic clothing and a number of scientific instruments."

Previously, Major Fiala had outfitted Dr. Herbert S. Dickey and his wife in their expedition to the Orinoco River in South America, where they had gone in search of a specie of white Indian. Young Theodore Roosevelt and Kermit Roosevelt were outfitted by Major Fiala in their Asiatic jaunt. Commander Dyot also availed himself of Major Fiala's adventure-system in his Brazilian exploits. Few famous explorers and hunters have escaped the Fiala influence.

With the exception of the use of the radio, polar exploring varies very little today from the time when Major Fiala's generation of adventurers penetrated to the poles.

Major Fiala has gained his knowledge of the exploration business in the hard school of experience. When he speaks, explorers about to set out for the ends of the earth listen attentively. They know the profundity of the man's advice. They know that Major Fiala is the specialist of the world of adventure. They recall how Fiala, descended from a famous Scandinavian line of explorers and adventurers, had been the commander of the Fiala-Ziegler Expedition of 1930-05.

Before that the proprietor of "Adventure Shop" had spent two years in the Arctic wastes on another expedition. He was an authority on polar explorations. He served in the Spanish-American war with distinction. He was a close companion of Theodore Roosevelt on his historic River of Doubt expedition.

What's more. Fiala served on the Mexican border in 1916 and was an officer in the ordnance department during the World war. Withal, he was an explorer, scientist, engineer, inventor and a conjurer in the mystic realm of thrilling adventures.

Stippled Polychrome Finishes

Sponge is dabbled over lacquer as shown above.

THE next time you wish to convert a piece of old furniture from an eyesore into something really attractive, try refinishing it in one of the stippled polychrome styles now in vogue. The object should first be sanded smooth and then coated with a quick drying lacquer, the color depending upon your taste.

The next task is to apply the top colors which blend with each other and the base coat to produce the desired effect. Powdered colors, bronze, aluminum, red, green and the like are used. The powders are mixed with the liquid to the consistency of thick cream and applied with a rubber sponge having a flat surface. The paint is applied by dabbing the sponge over the lacquer until the case is evenly spotted. Usually two top colors are applied, allowing fifteen minutes between coats.

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Flying Goose Radiator Cap

(Continued from page 161)

into the workbench.

Use pins or long brads for the axes of head and neck, and be sure the holes are large enough for the parts to move freely. A neat counterbalance weight for the tail is made by rolling a cylindrical piece of lead in an extension of the former, as shown in the drawings. When air currents force the tail to a horizontal position this weight moves up into a recess of the body shown in Fig. 1. Set your goose on a standard of galvanized wire to clip around the radiator cap, and give it a try-out before painting. If the wings flap too high or too low, or both, make the necessary adjustment by using thicker wood stops. You may need to change the tension of the rubber bands for smoother action.

After tests are made, by all means give your goose the very best paint job you know how. Give all wood parts a white groundcoat, and sandpaper smoothly when dry. The bird should, of course, be taken apart for the painting. Next, with a comparatively dry brush—that is, without paint dripping from it—touch in the brown feathers until only the wing tips are left white. Also leave the breast white, as well as the underpart of the body, a portion of the neck and a spot on the side of the head, as shown in Fig. 3. Black, glass-headed pins cut off to about ¼ in. are used for eyes, and they certainly give this lively fowl a determined look.

With a first rate paint job this radiator ornament will cause much comment, and if your friends call it a wild goose chase, there is fascination in the fact that while you never really catch him, he never actually gets away from you.

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Zebra Skin Makes Trophy Screen

Above photo shows the zebra skin trophy screen which decorates Captain W. H. Fawcett's office.

ONE day while grazing contentedly in the African veldt, an ill-fated zebra stopped a bullet fired by Captain Fawcett, expert marksman, world traveler, and publisher of MODERN MECHANICS AND INVENTIONS Magazine. When the zebra had kicked its last kick and turned up its toes to the blazing tropical sky, negro carriers of Captain Billy's hunting expedition proceeded to skin it, and thus start its hide on a long journey, with an ultimate destination of ending here in Minneapolis, where it now graces an attractive screen in Captain Fawcett's office.

Scientists Grow Hair on Glass

GROWING hair on glass was a feat recently accomplished by British scientists when they took tiny grafts of guinea pig hair and transplanted them to the surface of a watch crystal, feeding them with special extracts till the hair doubled and trebled in length. The experiment was performed at Wool Research laboratory.

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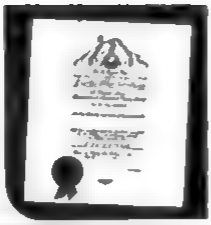

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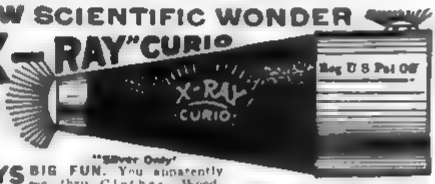

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Adventurers of Science

(Continued from page 104)

tales of a wonderful submarine city off the coast of Sevastopol.

It was then that scientists set to work with divers and giant searchlights. Their quarry was located 200 feet offshore. The city has been completely submerged and the divers found a semi-circular wall, a market-place, crumbling houses and a small amount of treasures. The reclaimed city flourished over 2,000 years ago and is believed to have been sent to the bottom of the sea by the violent earthquakes of 480 A. D. Millions of dollars of diggers' plunder lurks in old Chersonese and engineers are making plans for recovering it.

Athens, which has felt the restless onslaught of the steam shovel and spade for generations, has been girding herself for another attack this summer. Last winter the American School of Classical Studies secured the condemnation of thirty buildings on the Athenian agora, as the market-place is called, preparatory to excavations there. Perhaps another Acropolis group will be found. Millions will be spent to inquire into the mysteries which this site conceals—and perhaps the reward will net many millions of dollars more.

For the person, or group of persons, who seek adventure through the quest of subterranean treasure or lore, the realm over which he may roam is still virgin territory. Despite the vast sums of wealth which have been gathered since one of Napoleon's lieutenants found the Rosetta Stone near the Nile River in 1799, thereby offering a key to rich domains of scientific data and jewels, because it made possible the translation of the Egyptian language of the ancients, there still abound vast, untapped kingdoms.

A proof of the inexhaustible source of this ancient treasure-trove may be found in the excavations of the Egypt Exploration Society of London. It has 350 men at work in Upper Egypt. Among this group is Gilbert D. Phillips, an American student who sought this particular brand of adventure. Only a short time ago he unearthed a jar containing twenty-three small bars of pure gold with a market value of about $5,000.

In Lake Nemi, near Rome, two pleasure galleys of the Emperor Caligula have already been located. Through drainage operations

conducted by the Fascist government in 1928, one galley has already been recovered. Professor Ugo Antoniello in charge of the archaeological operations, has announced that he will bring a third one of Caligula's luxurious galleys into view. They disappeared 900 years ago.

Last January considerable furore was caused when Dr. E. L. Sudenik, a member of the faculty of Hebrew University, Jerusalem, announced that a tomb had been discovered at Jerusalem which bore the Aramaic inscription, "Jeshua Bar Jehoseph," meaning, "Jesus, Son of Joseph." Investigations were started to ascertain whether this was the tomb of Christ. Although it did not prove to be, the pages of archaeologist's story is replete with instances where their excavations gave proof to Biblical statements.

Although science has been endeavoring for centuries to locate the cradle of civilization, striving to determine the definite beginnings of human evolution, diggers in deserts, caves, plains, pits, mounds and other sites are constantly turning up evidence to overthrow the orthodox scientific beliefs concerning the beginning of man.

Today there are scores of excavators in the Orient seeking the secrets of man's origin. These diggers find their reward not in the golden-wares of other ages which they might unearth but in scientific discoveries they might make concerning the history of man. Similar work is going on in the Holy Land.

When one trains the attention on the operations of these men, one does not reckon with centuries but with cycles of thousands of years. For instance, in Montana a Princeton University expedition of scientists uncovered dinosaur eggs believed to have been laid 50,000,000 years ago.

Arizona has also been designated as the habitat of creatures which roamed the face of this globe millions of years ago. Roy Chapman Andrews found similar types of eggs, and even older ones, in Mongolia seven years ago.

Not long ago Dr. James A. B. Scherer, director of the Southwest Museum, announced that traces of man had been found in Gypsum Cave, near Las Vegas, Nevada. It had been previously believed that man had not inhabited North America until 10,000 years ago.

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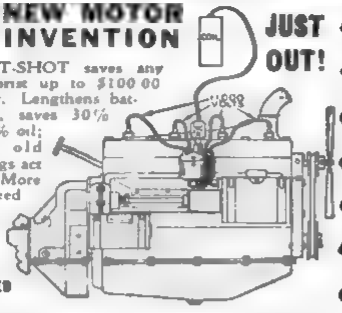

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World's Most Dangerous Game

(Continued from page 124)

50 m.p.h. or better is far from being a piece of junk, but just a car that hasn't a reputation for winning.

The dirt drivers talk a language of their own. A "lead footed" driver "unwinds her" and takes the turns "floored," meaning a pilot with a reputation for bearing down with his gas foot drives the car "all out" and takes his turns with the accelerator pedal down to the floor boards. Any car is a "piece of iron" unless it belongs to the "jallopy" class; connecting rods are the "galloping irons." The opposite of a lead footed driver is one with a "balloon foot." "Selling out" means to jump when a crash is about to happen. And last summer a driver asked me if I couldn't put zippers on the crank case so he could get in for a quick overhaul!

I've been in the dirt track game as driver and builder of racing cars for fourteen years, having driven my first race at Winchester, Ind., in 1917. I had patented the first overhead valve gear for a Ford and that same year, on the old Sharonville track at Cincinnati, cars equipped with my overhead valves won the first four places in a field of 25 cars.

We've learned a lot about high speed engines since those days. For example, who would expect that the length of the connecting rod has an important bearing on speed? Yet it is a fact that the shorter the rods, and the closer the piston to the crankshaft, the faster you can run the engine. The reason lies in the inertia of the rod, and the long rod is apt to whip itself to pieces before a race is half run. Another trick we have learned in rebuilding pleasure cars into racers is to move the engine back about ten inches, at the same time we are shortening the wheel base from around 108 to 90 inches. Moving the motor gives a better distribution of weight and helps take the turns in high speed skids.

For a time narrow tread was tried, with the idea that the closer the wheels were together the easier they would take the turns. But that was dropped, and now we stick to standard tread as it proved best. We do do one thing to the front axle, and that is to straighten out the camber in the right wheel (all dirt races being run counter-clockwise around the track). Straightening up the outside wheel and leaving the inner one leaning, or

with camber, helps considerably on the turns.

It probably will surprise many people to know that we only use 1/32 inch of babbitt metal in the connecting rod bearings, and that we no longer groove the bearing to distribute the oil. Instead of the bearing groove we turn a groove into the shaft, as we have found that gives better distribution of oil—which, of course, is supplied by force feed through the hollow shaft. The 1/32 inch of babbitt in the bearing is not just melted and poured in. Instead it is "thrown in" by centrifugal force from a feed member turning at around 5,000 r.p.m., and then ground down. By throwing the metal in we get better and more even distribution, and freedom from blow holes and other imperfections.

High compression and high turbulence are absolutely essential in a racing car. Various types of heads have been designed to increase these features in stock Ford and Chevie motors. One device known as the Hi-Turb head for Fords not only increases the compression but produces a churning or whirling motion in the combustion chamber which assures a perfect mixture of fuel and air.

The Chevrolet racers have been popular with the boys because you can get so many standard gear changes for them. Including Pontiac and other gears which can be used in the Chevrolet there are about seven gear sets which can be obtained for a few dollars each, whereas special gears would cost around $40 a set. With a full range of the standard gears a car is fixed for most any type of track or rules.

With cars of this type the dirt track boys are competing at times against some of the finest straight eights specially built for the speedways. The mile dirt track record of a living driver by the way, is held by one of Harry Miller's creations, piloted by Louis Snyder, who did a mile on the fair grounds track at Springfield, Ill., in 40.9 seconds. That was 1.98 seconds, however, slower than the all-time mile dirt track mark set by the late Frank Lockhart. Robert Carey, in one of our Chevies, did a mile in 43.9. The record for a ⅝ mile track is held by Mauri Rose, at 24 9/10 seconds, which compares well with Carey's 23 2/5 for the half mile at Winchester last fall.

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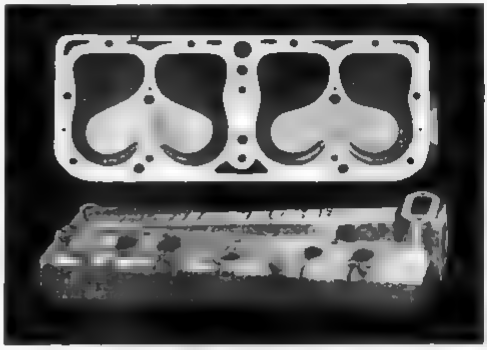

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Insects Teach Secrets of Invention

(Continued from page 96)

ment in Washington a study was made recently of spiders' webs. A silken thread spun by a spider was photographed through a microscope that magnified its diameter 2,000 times. Thus enlarged it looked about the size of a horsehair. A human hair magnified on the same scale would be six inches thick. This particular spider thread was measured and found to be thirty-two millionths of an inch in diameter. Yet, for its size, it was wonderfully strong,—comparatively far stronger than that of any cord or rope that man knows how to make.

Spiders antedated man in the solution of the problem of aerial navigation. Many of them are aeronauts. On a warm day, when a slight breeze is blowing, this mystery may be observed. A spider on a fencepost seeks to go by air. She spins and lets loose in the wind a number of threads, and when the wind gives sufficient pull, she lets go and is carried off. As she is carried up she turns herself back-downward and weaves with her feet a tiny cradle to lie in while enjoying her aerial voyage.

Wishing to descend, she pulls in some of the threads and thus reduces the buoyancy of her craft. Finding a suitable place to land she throws out a silken rope and then pulls herself to a leaf or branch and is ready for another adventure. It combines several complicated methods demanding skill and understanding.

Imagine a man walking down to the railroad tracks and, finding there a locomotive in his way, picking it up and carrying it for a mile or two. The ant accomplishes this in proportion, its strength being enormous. Ants studied by scientists of the government lifted a burden represented proportionately at 240,000 pounds. This would be 120 tons for a man.

If a man had the strength of an ant he could build a skyscraper without resorting to complicated derricks and engines. Giant girders would be like toothpicks, and each worker would carry a whole carload of bricks at a time.

Ants, too, Dr. Harlow Shapley of Mount Wilson Observatory discovered, have a mysterious ability to determine the weather. The scientists happened to observe a route of the ants. He noticed that the warmer the day the faster the ants marched. When the temperature was 50 degrees the ants ran at the

rate of 52 feet an hour. When the temperature was 100 degrees the ants sped up to 780 feet an hour, or fifteen times as fast. So accurate was this performance that Dr. Shapley could tell how warm the weather was within one degree simply by timing the march of the ants.

Just why the ant's body registered so unerringly cannot be told. It is another of Nature's mysteries. But Dr. Shapley believes it is a good illustration of the laws of chemistry and physics. To speed up action heat is administered, to slow up, cold.

Libraries have been written about the ant, yet it is a simple creature, although 140,000 of these tiny insects are necessary to weigh a pound. However the ant was the first creature to form organized societies, with division of labor in industry and complete cooperation in the affairs of life, with populations as large as our largest cities and so stable as to have endured for millions of years.

The flashes of light from the firefly is another mystery of science. If solved it may easily revolutionize the world's lighting and power systems. Dr. Walter Hough of the Smithsonian Institute says, "We do not know how to classify the chemicals which cause the light, or how to mix them properly if we could classify them."

The chemicals that bring the glow are called luciferin and luciferease for want of a better name. The tail of the firefly contains two cells. By a nervous action the luciferin goes through a tiny tube to the luciferease. The two materials immediately oxidize and a glow results. The oxidation turns the luciferin and luciferease back to their original states, ready for another twinkle.

Investigators of science are still seeking to unlock the mysteries of Nature. Judging the future from the progress of the past, it will be many years before all of the secrets will be known.

There is the ability of the katydid to rival the mechanical equipment of a violin by scraping a file across a membrane. The katydid can keep it up for hours upon hours without any diminution, but just why the little insect insists upon its mechanical chirp no one exactly knows.

There is the mechanical skill of the birds in building their nests to fit every condition. Nothing seems too hard for them. The nests

(Continued on page 208)

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(Continued from page 207)

are entirely adequate for their needs, are quickly made and will withstand the hardest storms, and will hold a weight of tremendous proportions considering their size and strength.

The mathematical skill of bees and wasps in laying out the honeycomb is marvelous. No engineer could surpass them. Then, too, the bee's ability to produce a longer tongue to meet its hunger needs is startling. Placed in a location where a longer tongue is needed the bee proceeds to grow it. Bee scientists are hoping to secure this secret for the general utilization and benefit of man in greater honey production by all bees, securing, thereby more nectar.

The queen bee, too, is able to control the sex of its offspring. Just how this is done is not known. If worker bees are needed, worker bees are hatched; if males, then males are produced. The hive queen is entirely efficient.

"Doctors" Keep Ships in Trim

(Continued from page 62)

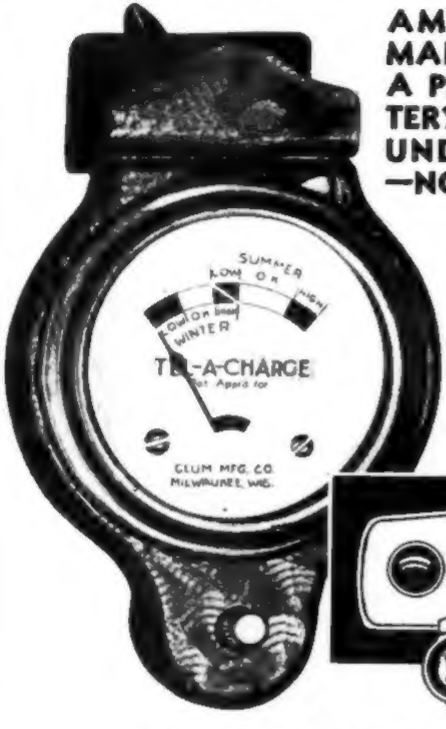
As much as a couple of hundred tons of shellfish, mostly mussels, are shaved off the ship's sides in drydock. These pests of the sea form a coating which can cut the speed down from twenty to fifteen knots. After the scraping comes the painting. The hull alone requires about ten tons of paint.

More than a thousand gallons of paint are required for the interior decorations which have to be touched up while the ship is in for its semi-annual sprucing. A ton of polish is consumed in brightening up the metal gadgets all over the boat. There's always lots of brass for Jack Tar to polish, to keep him out of mischief.

In a big liner there are a hundred furnaces which must be overhauled and cleaned. There are 750,000 blades in the turbines which must be examined and scraped. Two hundred tons of anchors and chains must be tested and painted, and miles of electric wires and water-pipes must be inspected. About 400 cabins must be gone over in every detail.

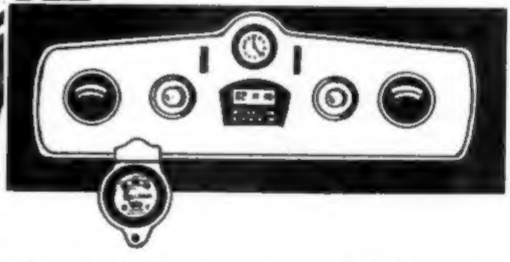
It has been conservatively figured by executives of shipping lines that each big ship has an average annual doctor bill of $500,000. The test by which you might judge how these maritime doctors keep the ship in perfect health is found in the scarcity of breakdowns or trouble of any kind out at sea.

NEW BATTERY METER ENDS CAR TROUBLES!



AMAZING INVENTION NOW MAKES IT POSSIBLE TO HAVE A PERFECTLY CHARGED BATTERY AT ALL TIMES-NO MORE UNDER OR OVERCHARGING —NO MORE DRY BATTERIES!

Here, at last, is a simple device that takes the trouble out of batteries. It seems almost magical in its perfection. It brings your battery under finger tip control. Batteries are too hard to get at and therefore usually neglected and abused. Tel-A-Charge shows the condition of your battery right from the dash board at all times.



DOUBLES LIFE OF BATTERIES

Battery experts find overcharging is one of the greatest factors in shortening the life of batteries. With Tel-A-Charge the dangers of overcharging are past.

Is there anything more annoying than having to crank an automobile to get it started, or to be pushed or towed? On a picnic, a lonely country road, a holiday ride, in city traffic, snow drifts, blizzards, railroad crossings, anywhere at any time, your car may stall. The three things that ruin batteries and cause them to run down are mostly overcharging, undercharging and too little water. None of these things can happen with Tel-A-Charge. When your battery is in perfect condition your motor starts easier, runs smoother, has more power, gasoline is saved and expensive troubles eliminated.

YOU CAN HAVE A TEL-A-CHARGE BATTERY METER ON YOUR CAR AND IT WILL COST YOU NOTHING!

No matter what kind of a car you have, Tel-A-Charge will fit it and anyone can attach it in just a few minutes' time.

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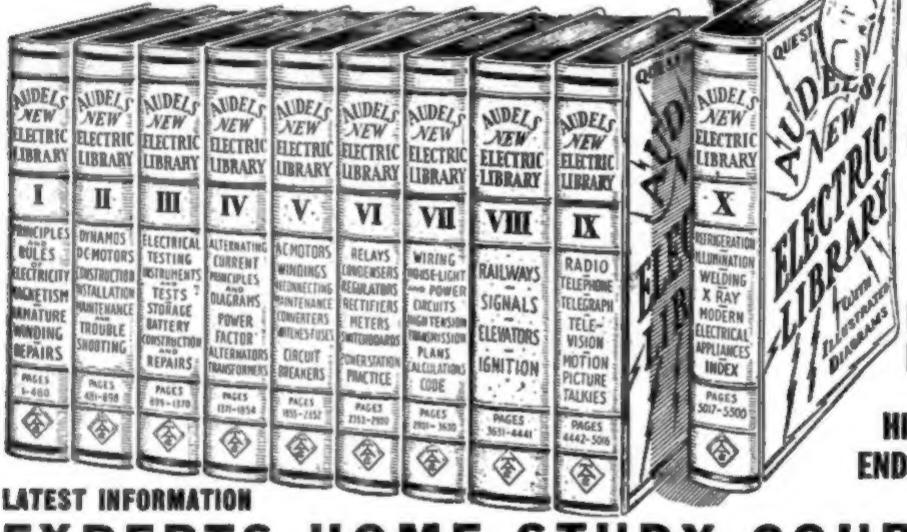

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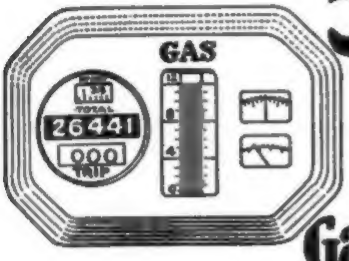
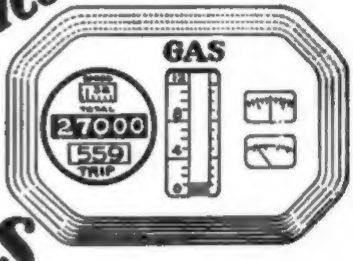


559 Miles on 11 Gallons of GAS



Think of it! FIVE HUNDRED FIFTY-NINE MILES over rough mountainous country burning only ELEVEN GALLONS OF GASOLINE. Imagine more than FIFTY MILES to the GALLON. That is what the WHIRLWIND CARBURETING DEVICE does for D. R. Gilbert, enough of a saving on just one trip to more than pay the cost of the Whirlwind.

THE WHIRLWIND SAVES MOTORISTS MILLIONS OF DOLLARS YEARLY

Whirlwind users, reporting the results of their tests, are amazed at the results they are getting. Letters keep streaming into the office telling of mileages all the way from 22 to 59 miles on a gallon, resulting in a saving of from 25% to 50% in gas bills alone.

Mark H. Estes writes: "I was making 17 miles to the gallon on my Pontiac Coupe. Today, with the Whirlwind, I am making 35 5/10 miles to the gallon. Am I glad I put it on? I'll say so!"

P. P. Goernen writes: "I made an actual test both with and without a Whirlwind, getting 13½ miles without and 34 6/10 miles with the Whirlwind, or a gain of 21 miles to the gallon. The longer the Whirlwind is in use on the machine the better the engine runs, has more pep and quicker starting. It makes a new engine out of an old one, and starts at the touch of the starter button."

R. J. Tulp: "The Whirlwind increased the mileage on our Ford truck from 12 to 26 miles to the gallon and 25% in speed. We placed another on a Willys-Knight and increased from 12 to 17 miles per gallon."

Arthur Grant: "I have an Oakland touring car that has been giving me 15 miles to the gallon average, but I can see a great difference with the Whirlwind, as it climbs the big hills on high and gives me better than 23 miles to the gallon of gas, which is better than 50% saving in gas."

W. A. Scott: "I had my Whirlwind for three years. Winter and summer it gives the same perfect service, instant starting, smoother running, and what I have saved in gasoline these last few years has bought other luxuries which I could not have afforded previously."

Car owners all over the world are saving money every day with the Whirlwind, besides having better operating motors. Think what this means on your own car. Figure up your savings—enough for a radio—a bank account—added pleasures. Why let the Oil Companies profit by your waste? Find out about this amazing little device that will pay for itself every few weeks in gas saving alone.

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In just a few minutes the Whirlwind can be installed on any make of car, truck or tractor. It's actually less work than changing your oil or putting water in the battery. No drilling, tapping or changes of any kind necessary. It is guaranteed to work perfectly on any make of car, truck or tractor, large or small, new model or old model. The more you drive the more you will save.

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No matter what kind of a car you have—no matter how big a gas eater it is—the Whirlwind will save you money. We absolutely guarantee that the Whirlwind will more than save its cost in gasoline alone within thirty days, or the trial will cost you nothing. We invite you to test it at our risk and expense. You are to be the sole judge.

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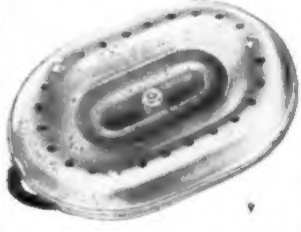

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